Graduation Project

Turtle Private Limited
Kolkata

Under the guidance of-
Academic Mentor - Asst. Prof , Mr. SS Ray
Industry Mentor – Nawneet Nihal

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NIFT Kolkata

Objective

Increase the units of production by reducing the Defects for minimizing the time required for rework.

Secondary Objective

- Decreasing the overall Defects per hundred unit.
- Decrease the throughput time of unit production.
- Train the operators to produce garments with no defects at the irst chance. (First Time Through)

Literature Review

Minimization of Defects in Garment during Stitching. (Pratibha Syntex Ltd. Pithampur, Indore)

The basic needs for productivity increase in the sewing department. We have to control the productivity by keeping the intension on the minimization of the defect in the sewing department through the actual taking the supervising & strict operating condition to be followed.

Type of Faults Affecting the DHU%

D.H.U. – IT stands for Defect per Hundred Units. It means number of defects found or detected per 100 garments. This is also known as DHU (Defects per Hundred Units).

-Ms.N.S. Patil, Mr.S.S.Rajkumar, Ms.P.W.Chandurkar, Mr.P.P.Kolte.

https://www.researchgate.net/publication/318393970_Minimization_of_Defects_in_Garment_during_Stitching

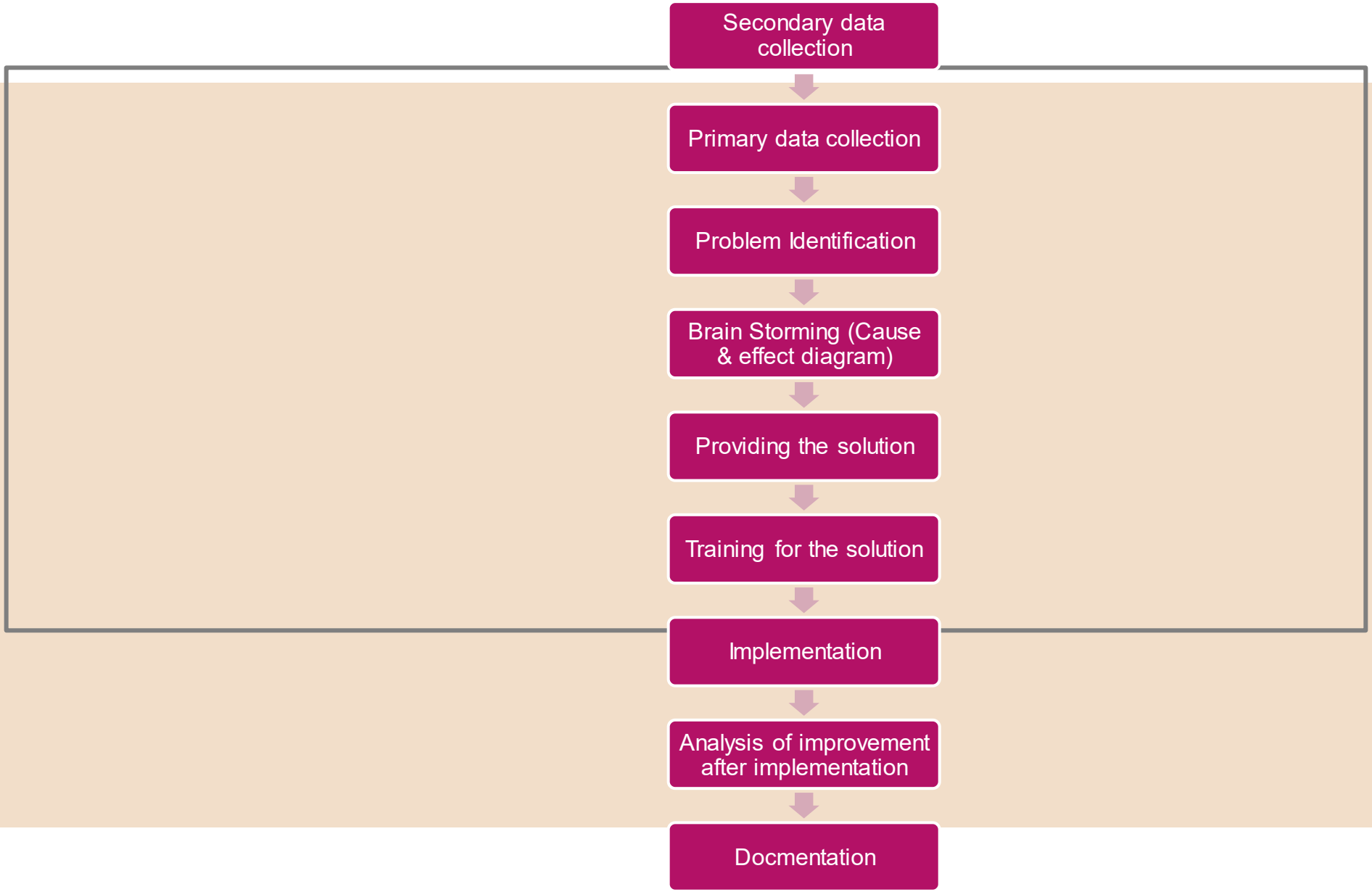
An Application of Pareto Analysis and Cause-Effect Diagram for Minimizing Defect Percentage in Sewing Section of a Garment Factory in Bangladesh.

This study contains use of quality tools to minimize defects and rework on garment industry. It includes the theoretical ideas about various defects, various quality tools specially Pareto Analysis and Cause-Effect diagram. The case study research conducted on the selected garment factory "Rainbow Apparel Limited". This segment includes the understanding about the quality control system of the selected factory and how this could be improved. The conceptual development includes the generation of ideas for minimizing defects by identifying major concerning areas and by providing respective suggestions. Finally, the last segment contains the comparative theoretical and mathematical evaluation about the quality control system.

- International Journal of Modern Engineering Research (IJMER)

https://www.google.com/url?sa=t&source=web&rct=j&url=http://www.ijmer.com/papers/Vol3_Issue6/CE3637003715.pdf&ved=2ahUKEwiNxsXh6JfqAhXLxzgGHZI_BeoQFjAAegQIAhAB&usg=AOvVaw223YfN3LpaAe3XOvP-R8qx

Research Methodology



Problem Identification

- Daily Production not reaching expected outcome.
- Alteration rate high.
- Defects repetitive.
- Production time loss due to alterations.
- Inaccurate data capture.

Need of the project

Under idle conditions the total unit produced per day is 1843 pcs.

Daily target 1700 pcs in Turtle Private Limited.

Daily Outcome – 1300- 1500 pcs approx.

Sr No:	Date	Per day production	Style 1	Style 2	Style 3	Style 4
1	13-Jan	1470	350	367	384	369
2	14-Jan	1455	332	368	392	363
3	15-Jan	1412	317	386	353	358
4	16-Jan	1442	319	367	401	355
5	17-Jan	1512	378	412	421	338
6	20-Jan	1469	369	367	407	326
7	21-Jan	1470	378	367	402	323
8	22-Jan	1441	388	360	325	368
9	23-Jan	1397	390	349	308	350
10	24-Jan	1470	413	321	367	367
11	27-Jan	1538	428	336	370	384
12	28-Jan	1518	382	343	414	379
13	29-Jan	1494	345	432	314	373
14	30-Jan	1459	364	391	335	369
15	31-Jan	1423	35	356	329	385
16	3-Jan	1397	349	402	310	369
17	4-Jan	1468	402	330	367	369
18	5-Jan	1518	380	339	379	423
19	6-Jan	1473	349	335	368	421
20	7-Jan	1447	310	362	366	409
21	2-Feb	1420	406	348	311	355

Reason for low production

Low production was mainly due to the time loss for rework on alteration.
It was observed that up to 21% operators were on rework each hour on a daily basis. (Through work sampling)

Day 1	Total no of work station = 89			
	Ideal	Working	alt pcs	alt %
1st hr	3	86	13	14.6
2nd hr	5	84	11	12.35
3rd hr	7	82	15	16.85
4th hr	7	82	12	13.48
5th hr	2	87	12	13.48
6th hr	4	85	14	15.73

Day 2	Total no of work station = 89			
	Ideal	Working	alt pcs	alt %
1st hr	2	87	16	17.97
2nd hr	3	86	14	15.73
3rd hr	3	86	17	19.1
4th hr	5	84	14	15.73
5th hr	2	87	15	16.85
6th hr	5	84	18	20.22

Day 3	Total no of work station = 92			
	Ideal	Working	alt pcs	alt %
1st hr	2	90	18	19.56
2nd hr	1	91	22	23.91
3rd hr	3	89	16	17.39
4th hr	4	88	20	21.73
5th hr	3	89	23	25
6th hr	1	91	19	20.62

Day 4	Total no of work station = 92			
	Ideal	Working	alt pcs	alt %
1st hr	0	92	13	14.1
2nd hr	4	88	17	19.31
3rd hr	2	90	16	17.77
4th hr	7	85	15	17.64
5th hr	3	89	13	14.6
6th hr	3	89	18	20.22

Day 5	Total no of work station = 92			
	Ideal	Working	alt pcs	alt %
1st hr	1	91	12	13.1
2nd hr	1	91	15	16.3
3rd hr	3	89	10	11.95
4th hr	1	91	15	16.3
5th hr	3	89	14	15.21
6th hr	4	88	13	14.1

Day 6	Total no of work station = 89			
	Ideal	Working	alt pcs	alt %
1st hr	0	89	13	14.6
2nd hr	2	87	16	17.97
3rd hr	0	89	14	15.73
4th hr	3	86	18	20.93
5th hr	1	88	15	17
6th hr	2	87	14	15.73

Day 7	Total no of work station = 91			
	Ideal	Working	alt pcs	alt %
1st hr	2	89	12	13.18
2nd hr	2	89	16	17.58
3rd hr	4	87	15	16.48
4th hr	2	89	14	15.38
5th hr	5	86	17	18.68
6th hr	4	87	15	16.48

Day 8	Total no of workstation = 93			
	Ideal	Working	alt pcs	alt %
1st hr	2	91	14	15.05
2nd hr	1	92	12	13.97
3rd hr	1	92	16	17.2
4th hr	4	89	18	19.35
5th hr	2	91	16	17.2
6th hr	3	90	16	17.2

Day 9	Total no of work station = 93			
	Ideal	Working	alt pcs	alt %
1st hr	0	93	12	13.97
2nd hr	2	91	15	16.12
3rd hr	1	92	12	13.97
4th hr	1	92	13	13.97
5th hr	2	91	16	17.2
6th hr	2	91	15	16.12

Day 10	Total no of work station = 90			
	Ideal	Working	alt pcs	alt %
1st hr	2	88	13	14.44
2nd hr	3	87	16	17.77
3rd hr	2	88	14	15.55
4th hr	4	86	18	20
5th hr	4	86	17	18.88
6th hr	3	87	14	15.55

Reduction in alteration Time loss

Since alteration was the primary reason to delay the production process work was proceeded to decrease the number of defects and hence produce more number of First Time Through (FTT).

This is done through reduction in Defects per Hundred Unit.

Benefits of DHU Reduction-

- Material movement time reduced.
- Rework Time minimized.
- Undoing the operation before rework not needed.
- Main production delay reduced.

Defects per Hundred Unit Reduction

Primary Data Collected for 5 styles.

Data is collected for 1 month.

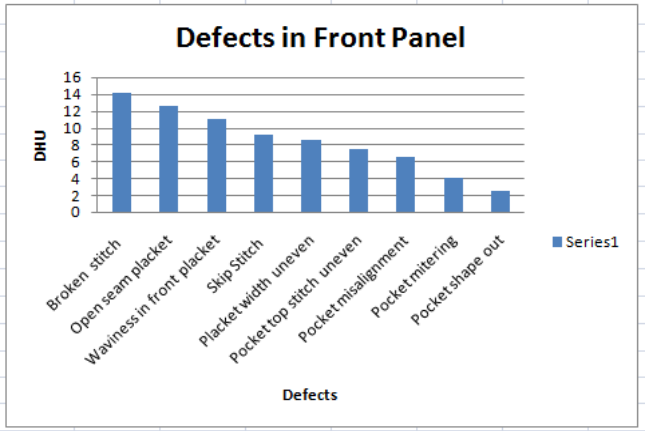
Top Defects from each section is noted.

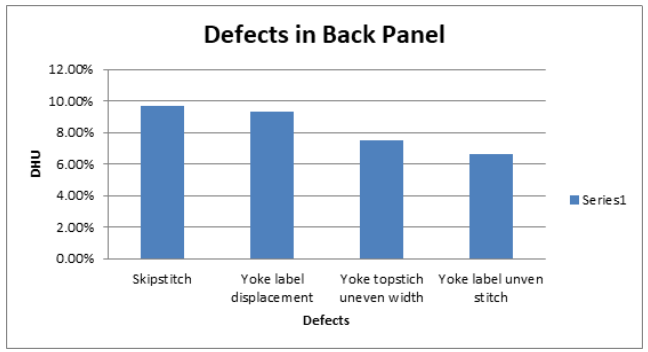
Root cause analysis is done by cause and effect diagram followed by why- why analysis.

Solutions are given for the same to reduce the repetitive defect.

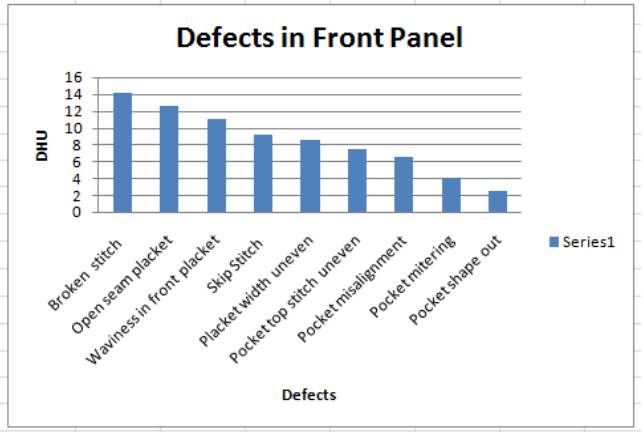
Primary Data of DHU

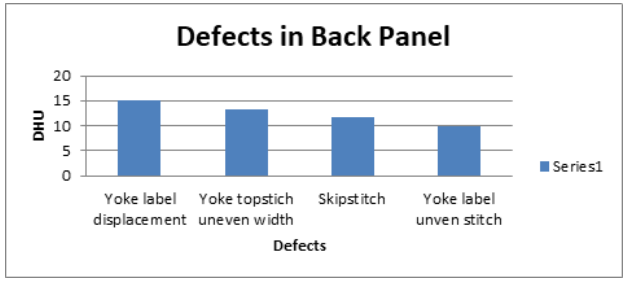
Style 1



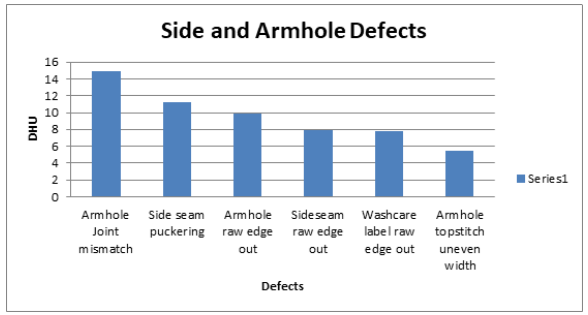


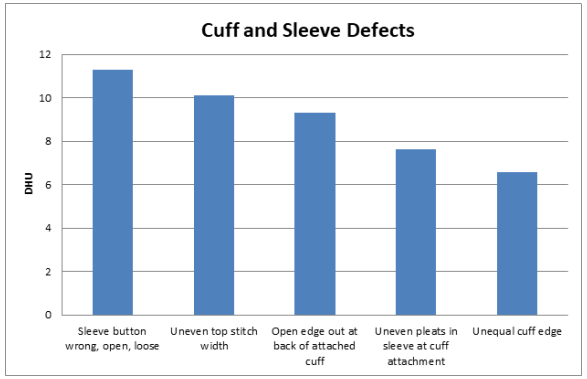
Style 2

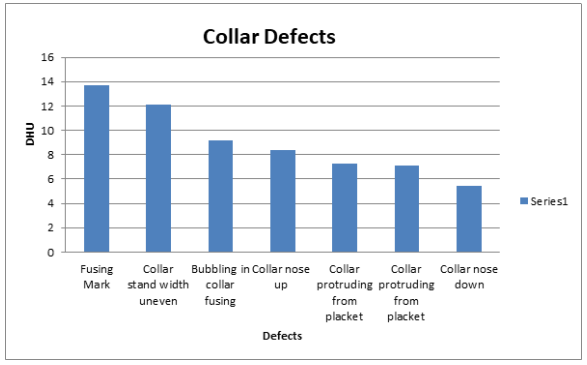


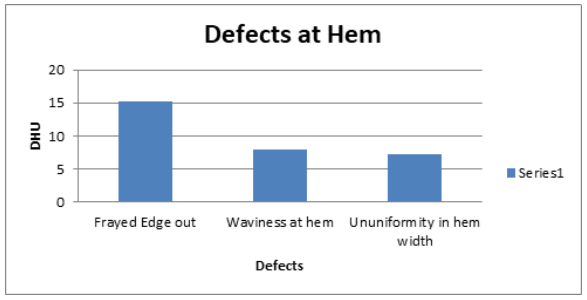


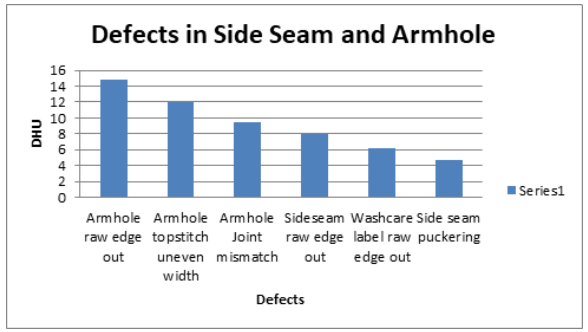
FRONT PANEL	28-Jan	29-Jan	30-Jan	31-Jan	1-Feb	3rd Feb			DHU %
Total pcs checked	282	289	308	296	279	315	1769		
Pocket misalignment	26	31	36	28	24	19	164		9.27
Pocket top stitch uneven	13	19	14	16	20	15	97		5.48
Pocket mitering	17	21	25	23	19	26	131		7.4
Placket width uneven	24	19	23	28	27	31	152		8.59
Waviness in front placket	23	18	21	29	22	26	139		7.85
Broken stitch	39	55	36	51	42	40	263		14.86
Open seam placket	29	24	34	26	31	30	174		9.83
Pocket shape out	22	23	18	20	21	16	120		6.78
Skip Stitch	39	37	46	36	40	36	234		13.22
BACK PANEL	28-Jan	29-Jan	30-Jan	31-Jan					DHU %
Total pcs checked	440	442	438	440	1760				
Yoke label displacement	42	25	31	26	124				7
Yoke label unven stitch	24	27	19	24	94				5.31
Yoke topstich uneven width	48	52	55	49	204				11.39
Skipstitch	47	41	38	50	176				9.94
SIDE & ARMHOLE	28-Jan	29-Jan	30-Jan	31-Jan	1-Feb	3rd Feb	4th Feb		
Total pcs checked	259	260	254	253	242	240	261	1769	DHU %
Armhole Joint mismatch	40	47	40	44	48	39	41	308	17.41
Side seam raw edge out	26	29	33	23	19	22	30	182	10.28
Armhole raw edge out	15	21	19	17	23	22	16	133	7.51
Waistband label raw edge out	11	17	15	14	19	18	21	115	6.5
Armhole topstitch uneven width	41	27	29	32	36	38	39	242	13.68
Side seam puckering	26	21	18	24	27	25	29	170	9.6
COLLAR & NECKLINE	28-Jan	29-Jan	30-Jan	31-Jan	1-Feb	3rd Feb			
Total pcs checked	297	277	314	283	292	306	1769		
Collar stand width uneven	26	19	24	32	28	22	151		8.53
Bubbling in collar fusing	32	37	32	34	27	30	192		10.85
Collar rose up	22	18	28	23	27	29	147		8.3
Collar rose down	26	23	15	23	20	16	123		6.95
Collar protruding from placket	31	25	27	32	36	31	182		10.28
Misaligned collar with back nape	21	27	31	30	29	36	174		9.83
Fusing Mark	55	39	51	42	47	45	279		15.77
CUFF & SLEEVE DEFECTS	28-Jan	29-Jan	30-Jan	31-Jan	1-Feb	3rd Feb			DHU %
Total pcs checked	279	315	308	293	285	289	1769		
Uneven top stitch width	41	43	34	37	31	37	223		12.6
Uneven pleats in sleeve at cuff attachment	28	25	22	23	15	20	133		7.51
Open edge out at back of attached cuff	28	19	27	31	28	24	157		8.87
Unequal cuff edge	13	17	15	20	14	16	95		5.37
Sleeve button wrong, open, loose	47	38	48	32	30	51	255		14.41
Sleeve button missing	21	15	12	23	17	15	103		5.82
HEM	28-Jan	29-Jan	30-Jan	31-Jan					DHU %
Total pcs checked	438	440	451	440	1769				
Frayed Edge out	62	86	79	87	314				17.75
Ununiformity in hem width	37	44	38	50	169				9.55
Waviness at hem	24	26	31	34	115				6.5

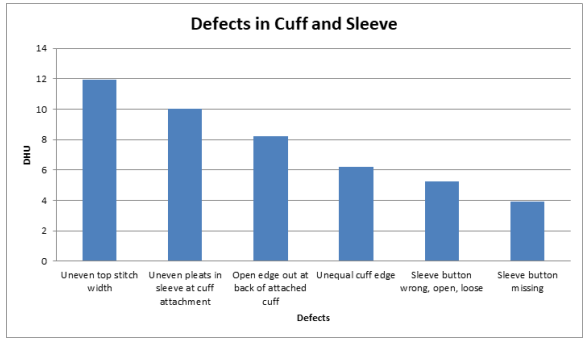

Side and Armhole Defects
DHU
16
14
12
10
8
6
4
2
0
Armhole Joint mismatch
Side seam puckering
Armhole raw edge out
Sideseam raw edge out
Washcare label raw edge out
Armhole topstitch uneven width
Defects
Series1

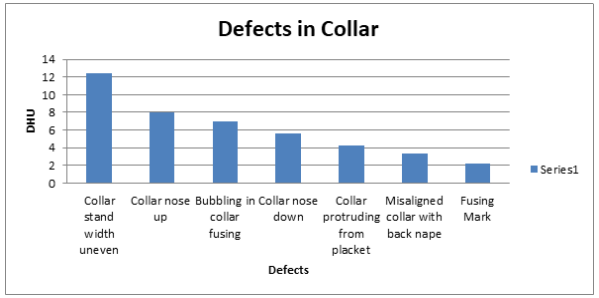

Cuff and Sleeve Defects
DHU
12
10
8
6
4
2
0
Sleeve button wrong, open, loose
Uneven top stitch width
Open edge out at back of attached cuff
Uneven pleats in sleeve at cuff attachment
Unequal cuff edge

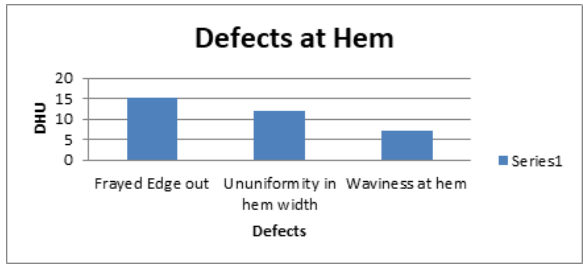

Collar Defects
DHU
16
14
12
10
8
6
4
2
0
Fusing Mark
Collar stand width uneven
Bubbling in collar fusing
Collar nose up
Collar protruding from placket
Collar protruding from placket
Collar nose down
Defects
Series1


Defects at Hem
DHU
20
15
10
5
0
Frayed Edge out
Waviness at hem
Ununiformity in hem width
Defects
Series1


Defects in Side Seam and Armhole
DHU
16
14
12
10
8
6
4
2
0
Armhole raw edge out
Armhole topstitch uneven width
Armhole Joint mismatch
Sideseam raw edge out
Washcare label raw edge out
Side seam puckering
Defects
Series1

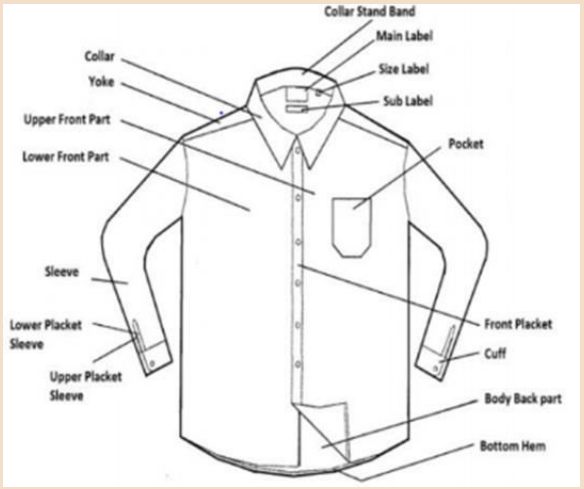

Defects in Cuff and Sleeve
DHU
14
12
10
8
6
4
2
0
Uneven top stitch width
Uneven pleats in sleeve at cuff attachment
Open edge out at back of attached cuff
Unequal cuff edge
Sleeve button wrong, open, loose
Sleeve button missing
Defects


Defects in Collar
DHU
14
12
10
8
6
4
2
0
Collar stand width uneven
Collar nose up
Bubbling in collar fusing
Collar nose down
Collar protruding from placket
Misaligned collar with back nape
Fusing Mark
Defects
Series1

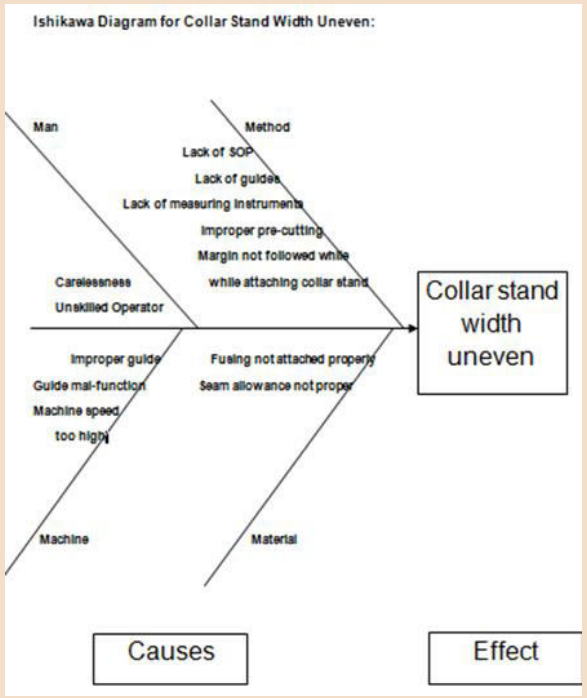

Defects at Hem
DHU
20
15
10
5
0
Frayed Edge out
Ununiformity in hem width
Waviness at hem
Defects
Series1

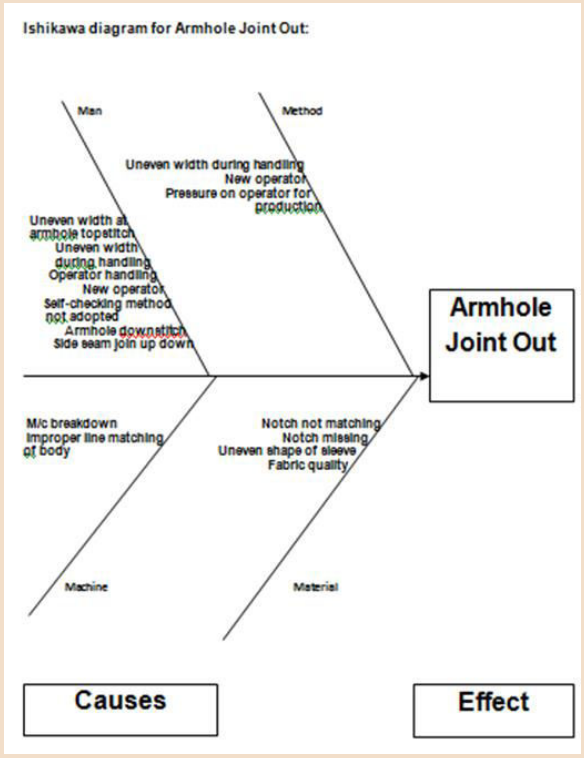
Top Defects from each section.

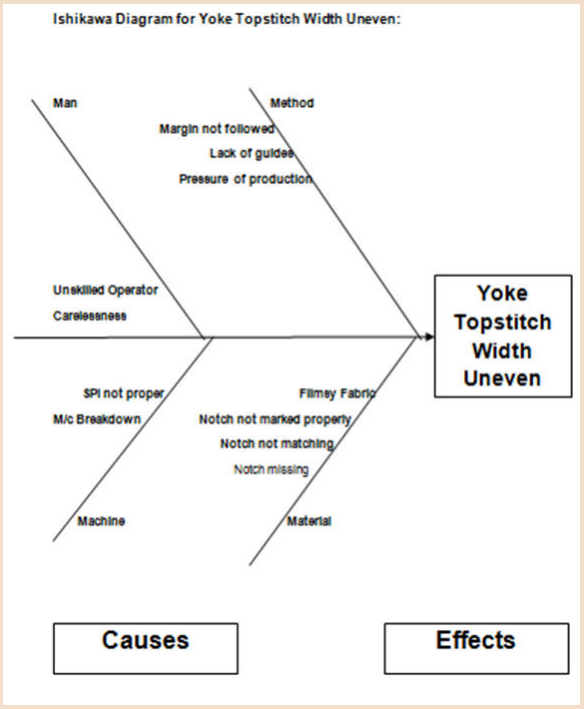
	FRONT & BACK PANEL	ARMHOLE, COLLAR & NECKLINE	CUFF, HEM & SLEEVES
STYLE 1	Skip stitch Yoke topstich uneven width Broken stitch Pocket misalignment Open seam placket	Armhole Joint out Fusing mark Collar stand width uneven Armhole topstitch width uneven Side seam puckering	Frayed edge out Sleeve button open loose wrong Un uniformity in hem width Uneven top stitch width
STYLE 2	Skip stitch Broken stitch Yoke topstitch uneven width Pocket misalignment	Armhole Joint out Collar stand width uneven Fusing mark Armhole topstitch uneven width	Frayed Edge out Uneven top stitch width Sleeve button wrong, open, loose

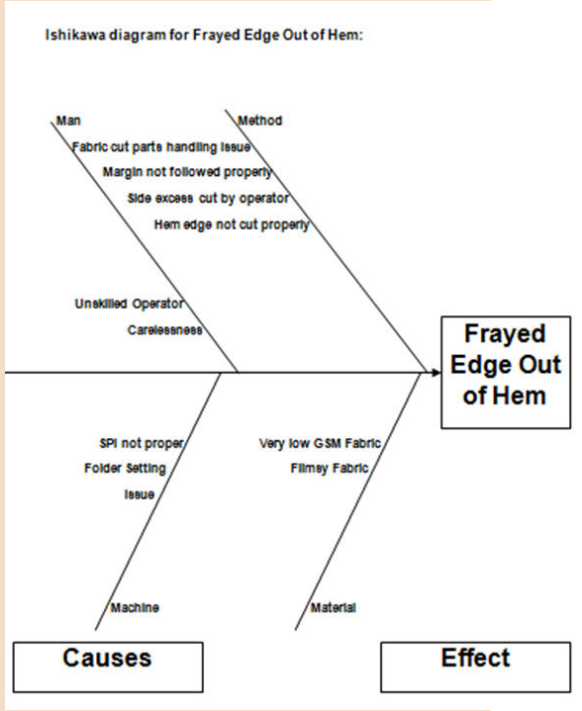


Fishbone Diagram for the top defects.









Why-why Analysis

Why-Why Analysis for Armhole Joint-Out:

Operator Handling	Improper feeding	• Inadequate Skill • Difficult to handle material	• Required A* operator • Proper training to be given • Frequent operator change
	Unnecessary pulling of plies	• Notch not marked properly • Operator busy talking • Improper sleeve shape	• Operator busy talking
Armhole down stitch	Non uniform	• Inadequate Skill	• Required A* operator • Required training • Frequent operator change
	Too much WIP	• Inadequate Skill • Improper machine working • Too much rework	• Non availability of maintenance personnel
Operator's negligence	Too much Rework	• Inadequate Skill • Pressure for production	• Required A* operator • Too much WIP • Operator inefficient

	Frustration	• Pressure for production • Fight with other operators	
	Bad mood	• Personal problems	
Side Seam Up Down	Difficult to handle fabric	Specification sheet	
	Unnecessary pulling of plies	Operation requirement	
	Operator negligence	Too much WIP	• Inadequate Skill • Too much rework
Improper line matching of body	Too much rework	Inadequate skill	
		Pressure for production	• Too much WIP • Operator inefficient
	Inadequate skill		
	Improper machine working	Non availability of maintenance personnel	
Disturbance by other operators	• To give rework pieces • To show the mistake • To talk • To get their work done	• Other operators cannot do that work • Other operator's are overloaded	• Under skilled operator • Inadequate skill

Mismatch of Notch	Notch not marked correctly	Operator not paying attention	Talking with other operators
	Notch not followed properly by sleeve attach operator	Operator inefficiency	Inadequate skill
		Operator not paying attention	Pressure for production Bad day
		Pressure for production	Too much WIP Operator inefficient

Proposed Solutions

MOCK DEVELOPMENT

- Develop a 3D mock of the critical operations for the operators to clearly visualize the desired outcome.
- They would be hung on the machine in front of the operator so that operator always knows what is correct and what is wrong.
- They would be provided with important information and measurements for the operations.

Standard Operating Procedure.

To provide standard operating procedure
Helps to distinguish right or wrong methods
To provide step-by-step written procedure about how to do a job.
SOP gives desired result and maintains consistency in results.

Standard Operating Procedure (SOP) to be made for-
All Critical Operations of Shirt
Collar Section
Body Assembly Section
Sleeve Assembly Section

Implemented Solutions

ATTACHMENT OF WORK AID

THE PROBLEM
Uneven placket width
Problem of puckering, roping

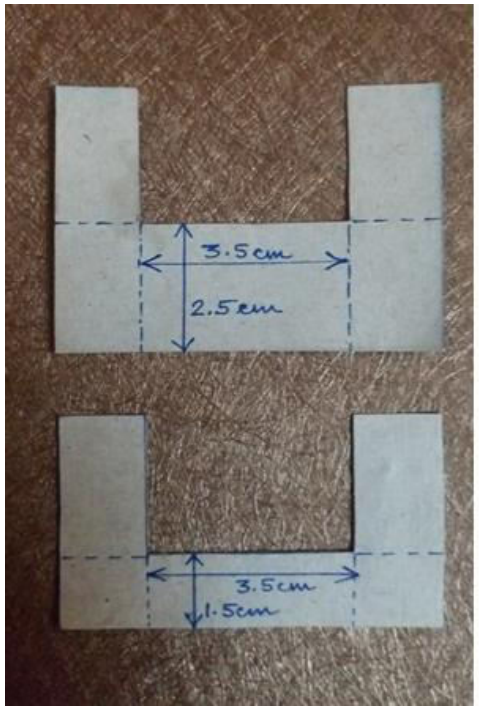
THE SOLUTION:

Anti puckering kit
Has a transparent glass guide.
Training has been provided to the operators on how to use the guide and needle plate.

DEVELOPMENT OF TEMPLATE

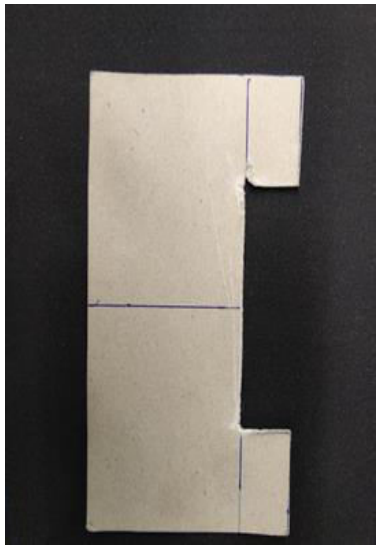
THE PROBLEM
Uneven gap in label placement

THE SOLUTION
Templates have been developed to ensure the right placement of the labels on the yoke panel.



Other Solutions

Use of White Gloves to prevent Stains.



Template development for Main Label Attachment

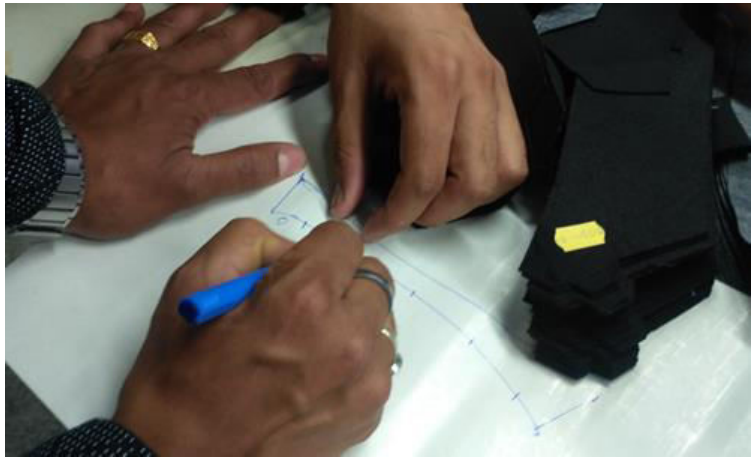
Setting up of Correct Thread Tension

Teflon Coated Pressure Foots and Throat Plate should be used to prevent oil marks leaking from Machine.

Training

TRAINING REGARDING THE CRITICAL OPERATIONS

I had planned to organize training regarding the critical operations.
Attachment of collar:



TRAINING OF OPERATORS REGARDING TLS IMPLEMENTATION