Silver Spark Apparel Limited

PROJECT

Development of Real Time Production Monitoring System &
Enhancement of Productivity of Cutting Department

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Introduction

ABOUT SILVER SPARK APPAREL LIMITED

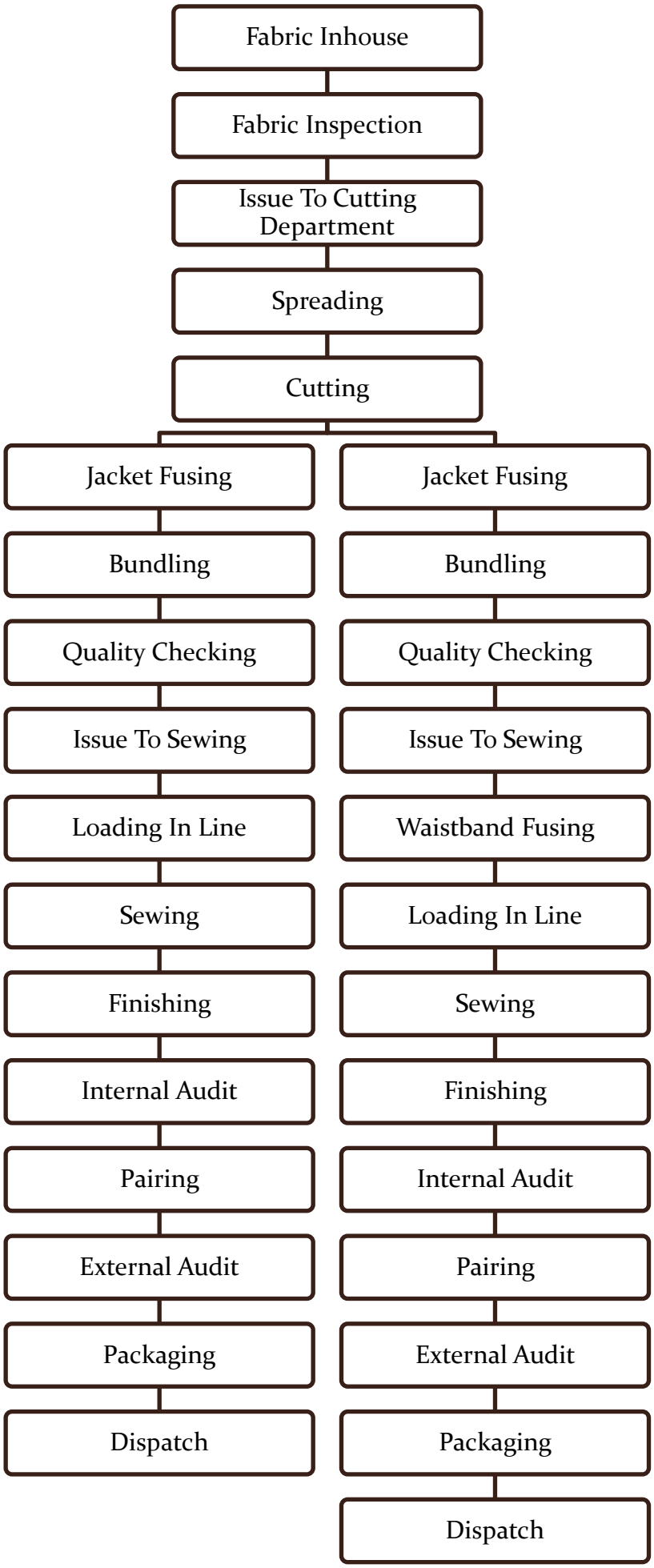
PRODUCT PORTFOLIO

Silver spark Apparel Ltd (SSAL) is a part of an 80-year-old leading business group in the garment industry, Raymond India ltd. It is a wholly owned subsidiary of the Textile and Apparel major Raymond Limited making the group's foray in Global Apparel Outsourcing market.

The facility manufactures garments catering largely to export markets and are at par with best in class from Japan and Italy.

Premium Full Canvas Hand Made Suits	Manufactured only by Raymond in India	No use of any thermo fusible interlining inside it which makes it extremely soft and comfortable to wear with a very snug fit
Premium Half Canvas Suits	Manufactured only by selected handful manufacturers in India	Uses minimal thermo fusible interlining to achieve a perfect balance between comfort body movement and a crisp look
Made to Measure	Only Business model in India, integrating customised tailoring with factory finish. Presence: Pan India Middle East	Offers an unparalleled range of choice in fabric, style and personalisation
Trousers	State of Art manufactured only by selected handful manufacturers in India	Offers an unparalleled quality in fabric, and fit
Vest	Manufactured only by selected handful manufacturers in India	Offers an ensemble for The Complete Man
Lithography	Only Business model in India offering customised leather accessories with a personal touch from a Brand	Provides customers with customised premium range of leather accessories with a personal touch

MATERIAL FLOW



PROJECT

DEVELOPMENT OF REAL TIME PRODUCTION MONITORING SYSTEM
& ENHANCEMENT OF PRODUCTIVITY OF CUTTING DEPARTMENT

OBJECTIVE

- Increase output of cutting department
- Reducing idle time of cutting machine heads and increasing their cut time
- Reducing recutting
- Increasing order traceability

INTRODUCTION

The Macintosh unit is a job work unit for the buyer Joseph Abboud. The trims, style and fabric information are sent to the Macintosh unit in XML format.
The CAD department at Macintosh downloads the tracksheet which contains all the information required to produce the garment. Then the patterns and marker are developed. The tracksheet is then sent to the sub-store where the required fabrics of the order are added to a tray.
The cutting machine operators pick up this tray, scan the tracksheet to open the marker, spread the fabric onto the machine bed and cut the fabrics.
The bundle is then picked up by the fusing machine operators who fuse the required panels and pass the bundle to the ready cutting table.
At the ready cutting table, garment parts are ready cut after procuring paper patterns. Then the pocketing fabric, chest canvas, sleeve head and shoulder pad are added to the bundles and the garment is sent forward for the quality check.
The quality checker ensures the measurement, fabric, face side, checks matching and style are correct. If the garment passes, the bundle is loaded into the sewing line and if it fails, the bundle is sent to the recutting table.

NEED

The buyer had decided to give the unit 1000 purchase orders per day. Currently, the unit was receiving 700 purchase orders per day and this number was bound to increase. The cutting department's output would not cross 400 purchase orders per day. This created a backlog and increased the lead time.
In the Macintosh unit, the cutting department was the bottle neck because it was a mass customization unit where each order was cut separately and not in lays of multiple plies.

DEPENDENCIES

- Machine Availability
- Absenteeism
- Feeding from stores
- Worker's efficiency
- Skill inventory

DATA COLLECTION METHODS

- Time Study
- Work Sampling
- Video Analysis
- Elemental Breakdown
- Root Cause Analysis

METHODOLOGY

In order to understand the reasons for the low output of the cutting department, first, elemental breakdown was done for every activity in the cutting department and then a time study was performed. Furthermore, work sampling of the cutting machine heads and operators was carried out. Additionally, the reasons for excessive recutting were analyzed through a root-cause analysis. With the help of this research, machine designs and processes were altered to improve productivity.

UNDERSTANDING THE ACTIVITIES IN CUTTING DEPARTMENT

In order to understand the

- movement of materials
- obtain the time it took for orders to move from one sub section to another
- processes which were the most time taking and had to be targeted

A detailed time study was performed.

S.No.	Operation	Time
1.	Cut shell fabric	5:22
2.	Cut Lining Fabric	3:45
3.	Cut Knee Lining	0:48
4.	Cut Sleeve Lining	1:49
5.	Attach Swatch	0:49
6.	Add Collar Felt & Fusing	0:28
	To prepare tray in store	13:01
7.	Spreading	11:14
8.	Cutting	5:06
9.	Picking	3:56
10.	Bundling	2:39
	To cut fabric on cutting machine	26:55
11.	Fusing Trouser	4:37
12.	Fusing Jacket	7:48
	To fuse the suit	12:25
13.	Print Pattern	2:37
14.	Ready Cut Jacket	6:49
15.	Add Canvas	1:03
16.	Ready Cut Trouser	4:37
	To ready cut	15:13
17.	Quality Check Jacket	15:00
18.	Quality Check Trouser	8:21
	To check quality	23:21
19.	Waiting	90:07

After performing this time study, the following problems were found and in order to increase production, the following areas were required to be targeted:

1. Bundle Missing
    a. Time was consumed in finding missing bundles or recutting misplaced bundles
2. Store
    a. Time required to cut shell fabric
    b. Time required to measure shell fabric
3. Cutting
    a. Time required to get fusing and felt from store
    b. Time required to spread the fabric
    c. Cutting machine breakdown
    d. Time required to pick, sticker and bundle the cut parts
4. Fusing
    a. Time required to search for fusing
5. Ready Cutting
    a. Time required to print patterns and ready cut collar and collar stand
6. Bundling
    a. Time required to issue materials
    b. Time required to tag garment parts
7. Recutting
    a. Time was consumed in recutting parts which were cut wrong

1. ORDER TRACKING

PROBLEM

In the cutting department of a make to measure factory all orders were cut as single ply. Block cutting each garment individually not only consumed considerable amount of time but also required additional manpower.

SOLUTION

Tracking sheets of individual garment would be scanned at the cutting machines and numerous quality checkpoints in order to open the marker. In order to improve the traceability of purchase orders, this prior process of scanning tracking sheets at various locations was integrated with the order tracking system.

First, a python application was created and installed on every cutting machine and quality checking table. This application would detect every purchase order number inputted on the computer in order to open the marker (no additional scanning was required) and update the order's location along with the time and date into an excel file on the centralized network. In this way, real time production reports were produced. (*Refer annexure 5 for sample report*)

PO Number	Time	Date	Cutter	Status
MCA4V2Z	06:03 AM	20/08/19	QC TABLE 1	not passed
MCA4UWL	06:22 AM	20/08/19	QC TABLE 1	not passed
MCA4UUZ	06:37 AM	20/08/19	QC TABLE 1	not passed
MCA4UJV	06:54 AM	20/08/19	QC TABLE 1	not passed
MCA4UNP	07:21 AM	20/08/19	QC TABLE 1	not passed
MCA4UZ1	07:38 AM	20/08/19	QC TABLE 1	not passed
MCA4UZ1	07:40 AM	20/08/19	QC TABLE 1	passed
MCA4UZ1	07:40 AM	20/08/19	QC TABLE 1	not passed
MCA4VHG	07:48 AM	20/08/19	QC TABLE 1	not passed
MCA4VHG	08:02 AM	20/08/19	QC TABLE 1	not passed
MCA4UKY	08:32 AM	20/08/19	QC TABLE 1	passed
MCA4WNE	08:59 AM	20/08/19	QC TABLE 1	passed
MCA4WLU	09:06 AM	20/08/19	QC TABLE 1	passed
MCA4WCF	09:11 AM	20/08/19	QC TABLE 1	passed
MCA4VTF	09:18 AM	20/08/19	QC TABLE 1	passed
MCA4VRT	09:27 AM	20/08/19	QC TABLE 1	passed
MCA4WJA	09:37 AM	20/08/19	QC TABLE 1	passed
MCA4WUA	09:42 AM	20/08/19	QC TABLE 1	passed
MCA4WGX	09:51 AM	20/08/19	QC TABLE 1	passed
MCA4UDN	10:04 AM	20/08/19	QC TABLE 1	passed
MCAA4WF	10:25 AM	20/08/19	QC TABLE 1	passed
MCA4WFC	10:36 AM	20/08/19	QC TABLE 1	passed
MCA4WFC	10:36 AM	20/08/19	QC TABLE 1	passed

Fig: Snippet of Excel Report

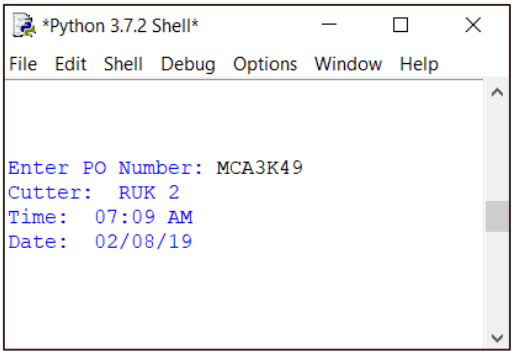


Fig: Snippet of the report

Second, another program was developed where the user could enter the purchase order number of the garment which had to be located and the program would output the latest location of the order, that is, the workstation where the tracking sheet was last scanned. The supervisors were trained on how to use the program.

Fig: Training Session

2. STORE

2.1. PROCESS CHANGE

PROBLEM

a. The sub store was not able to provide cutters with the required feed and this resulted in the cutters being idle. This further led to delay in production and inability to ship the days orders.
b. Cutting machine operators had to get fusing from the sub-store.

SOLUTION

a. Previously both the shell fabric and lining fabric were cut and kept in trays to feed to the cutting department. In order to ensure continuous feed, the shell fabric was fed to the cutting department in roll form itself when more than 10 purchase orders had the same shell fabric.
b. Previously, operators would cut the knee lining fabric from the fabric roll. Instead, knee lining fabric was cut in bulk based on an intensive study on the average length of knee lining fabric and operators would only have to pick and put the pre-cut fabric in the tray, thereby, saving about 1 minute on every order.
c. Fusing was added to the tray provided from the sub-store.
d. Formerly, operators had to match the code written on each fabric roll with the fabric code on the tracksheet. Later, each fabric roll was given an alphanumeric code and this code was written on board which allowed the operators to identify required rolls faster.

Fig: Before installation of board

Fig: After installation of board

A1	4137
A2	9545
A3	4128
A4	4187
A5	4188
A6	4139
A7	4121
A8	4192
A9	4196
A10	4191
A11	4194
A12	12662
A13	4189
A14	4151
A15	4166
A16	4157
A17	4143
A18	9548
B1	12658
B2	4130
B3	9547
B4	4174
B5	4149
B6	4193
B7	4123
B8	9543
B9	4155
B10	9544
B11	4177
B12	4152
B13	4150
B14	4127
B15	4133
B16	4159
B17	16640
B18	4163
C1	12660
C2	12661
C3	4122
C4	16635
C5	16636
C6	6967
C7	16634
C8	6972
C9	6971
C10	6968
C11	6970
C12	6969
C13	17068
C14	17070
C15	17063
C16	17072
C17	17069
C18	17071

Fig: Board with fabric codes

2.2. INSTALLATION OF LASER LIGHT

PROBLEM

Measuring fabric for every order was time consuming.

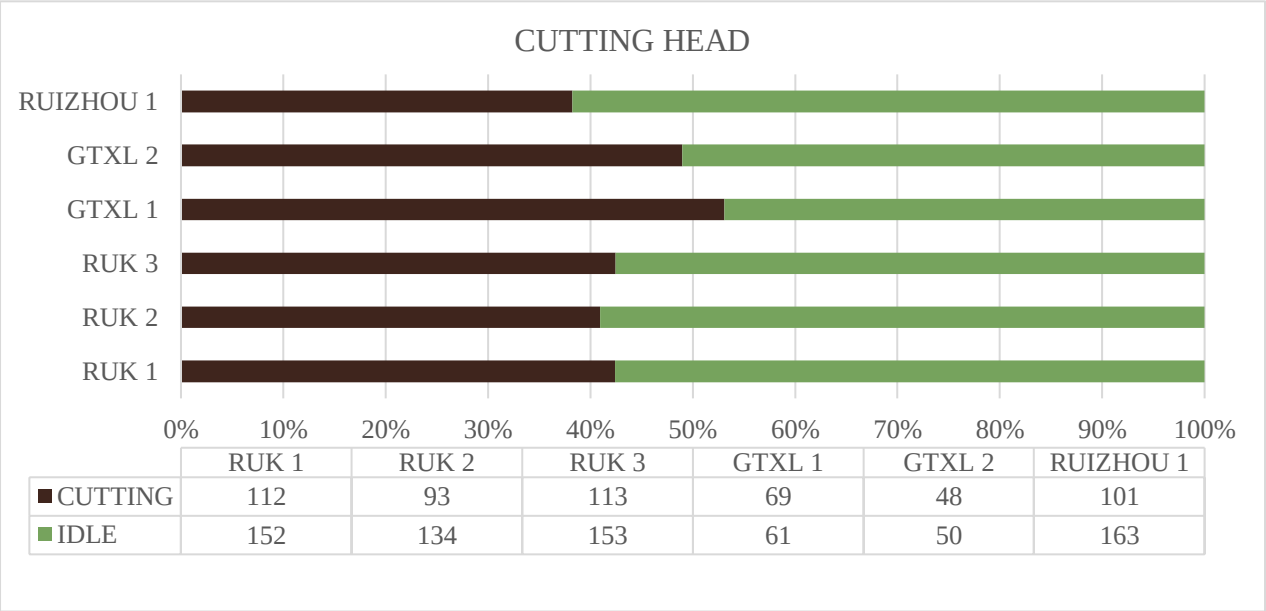
SOLUTION

A laser light, round knife cutting machine and a table were installed in front of the carousel machine. When the consumption was entered in a touch screen monitor the laser light would move the required distance, the operator would pull the fabric till the laser light and cut the fabric using the round knife cutting machine placed at the end of the table.

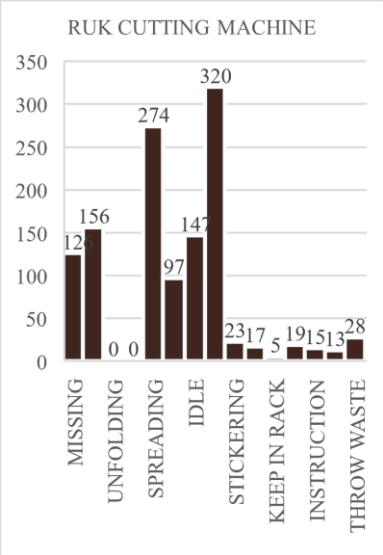
Fig: Laser light with carousel machine

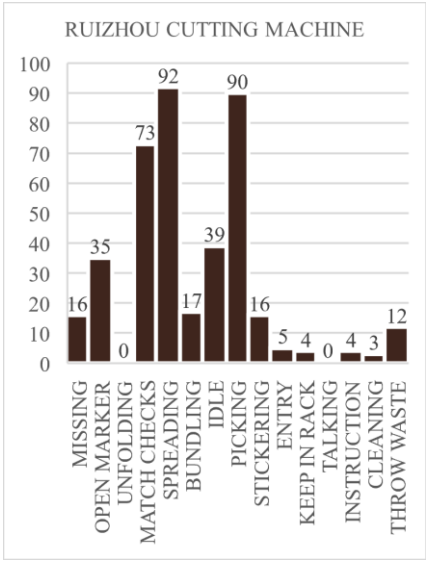
3. CUTTING SECTION

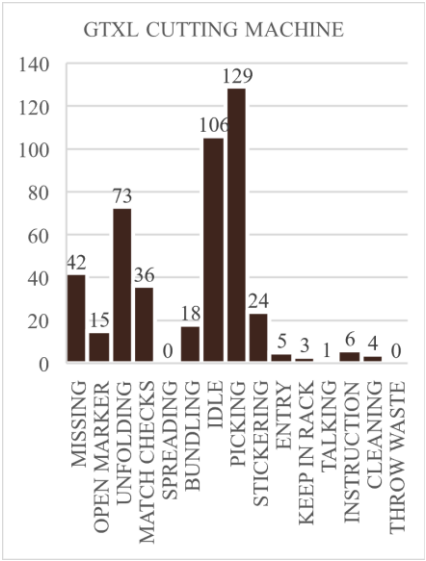
WORK SAMPLING



	RUK 1	RUK 2	RUK 3	GTXL 1	GTXL 2	RUIZHOU 1
CUTTING	112	93	113	69	48	101
IDLE	152	134	153	61	50	163







The above graphs showed that the reason behind the low output of the cutting machines were:

- Time required for checks matching
- Frequent knife break in the Ruizhou cutting machine
- Operator missing – get fusing from store

3.1. CHECKS MATCHING TIME ON RUIZHOU CUTTING MACHINE

PROBLEM

a. On the Ruizhou Cutting Machine, the checks matching process included a step where a projected grid (neon green) was resized using the arrows keys in order to match the checks on the fabric. This process took about one minute per garment being cut.

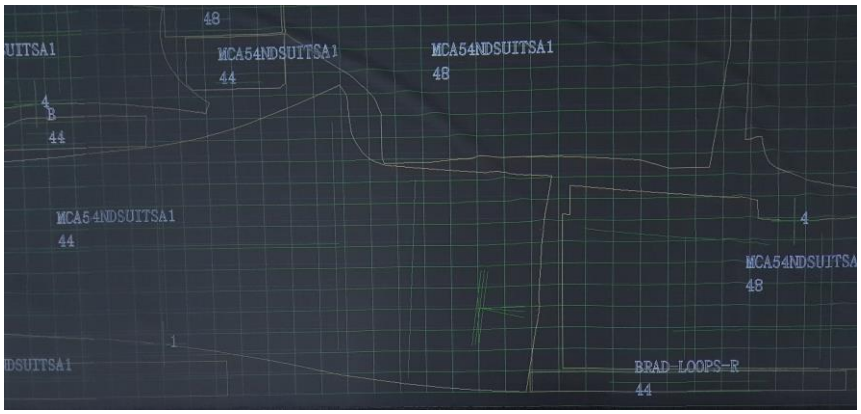


Fig: Matching of the projected grid with checks of the fabric

b. Checks fabrics were being cut only on Ruizhou (auto nester) & Gerber Cutting machines (full width). Sometimes the orders or feed of solid fabric would get exhausted and the three Ruk cutting machines would remain idle and Ruizhou and Gerber cutters would have a lot of WIP.

SOLUTION

A swatch file of all the available checks fabrics with each checks fabric's x and y repeat size was created.

a. Cutting machine operators could match the projected grid with checks of the fabric by directly entering the repeat size directly in the software.
b. With the details of repeat size of every fabric, the CAD department could make manual markers to cut checks fabric on Ruk Cutting Machine.

Fabric Code	REPEAT SIZE	
	X (CM) (Along selvedge)	Y (CM) (Perpendicular to selvedge)
4149	4.7	3.9
4163	4.7	3.8
4123	4.3	3.6
9548	3.8	3.5
4127	4.9	4
17071	5	4.7
4139	4.8	4
4152	5.4	4.2
17070	4.5	3.5
17069	5	4.5
4137	5.3	4.6
4150	4.8	3.9
4174	5.3	4
4177	4.7	3.7
4166	5	4
4130	6	5.3

Fig: Repeat size of checked fabrics

3.2. KNIFE BREAK ON RUIZHOU CUTTING MACHINE

PROBLEM

The Ruizhou machine is used to cut garments with checked shell fabric. The fabric is laid on fold. In order to match the checks and prevent the layers from moving, the operators would staple the fabric onto the bed. Later, these pins would break the knife and cause rash cutting.

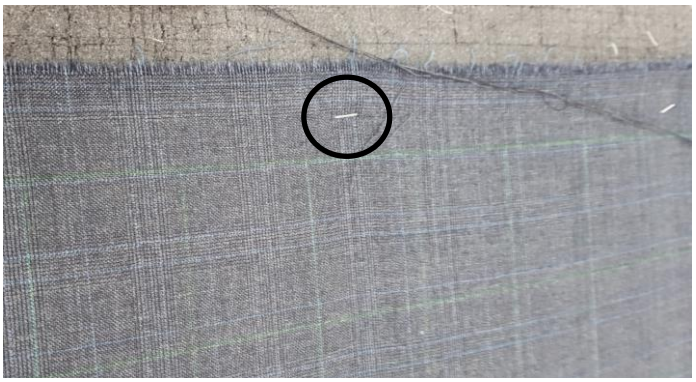


Fig: Use of staples on Ruizhou Machine Bed

- Cost
  - The cost of each blade was Rs.750
  - Nearly 4 blades were getting damaged on daily basis.
- Time
  - The knife change process required 20 minutes
- Hazard

Fig: Rash Cutting, Joint Cuts, Damaged Knife, Pins Picked Using Magnet (left to right)

SOLUTION

The magnetic property of the pins was used in order to remove all the pins from the bed before laying the next fabric. A powerful magnet provided to the machine operators who were trained to pick up all the pins from the bed using the magnet by just moving it across the bed once.

3.3. HIGH OPERATOR IDLE TIME

PROBLEM

The work sampling data showed that cutting machine operators were idle for 10% of the time.

SOLUTION

One operator was eliminated from every machine saving the company Rs.7000 per month per machine. This meant that the company would save Rs.56,000 per month.

4. FUSING SECTION

4.1. INSTALLATION OF RACK AND CONVEYOR

PROBLEM

- Crowded workspace
- Parts Missing
- Low output
- No Standard Operating Procedure

Fig: Fusing Machine before Installation of Rack

SOLUTION

To solve this problem, a rack and conveyor set up was added in front of the fusing machine.

- Conveyor: A longer conveyor was added in front of the fusing machine, so that operators could directly put the pieces onto the conveyor once the fusing and shell set up was ready.
- Panel over the conveyor: Panels were made of acrylic sheets to keep on top of the conveyor between railings. This increased the workspace for the operators.
- Angled rack: Two racks were placed back to back at a 120^0 angle. These racks were divided into 3 color coded columns and 4 rows. Each column was assigned one operator.
- Job Reengineering: Each operator was assigned to work on specific panels. As they worked on the same panels repeatedly, their efficiency increased.

Fig: Fusing Machine after Installation of Rack

4.2. PARTS FUSING CUT AT CUTTER

PROBLEM

Formerly, fusing was cut in bulk in 3 sizes. In order to fuse garments of other sizes, the fusing had to be trimmed. This process was time consuming and reduced the fusing quality

SOLUTION

Fusing was cut with the shell and lining fabric at the cutter for individual garments instead of cutting in bulk. This eliminated the need to trim the fusing, thereby, increasing productivity.

5. READY CUTTING

5.1. CUTTING COLLAR & COLLAR STAND MANUALLY

The collar and collar stand of garments with checked fabric were block cut and later the CB notch was matched and cut manually using a paper pattern.

Once the piece was received by the ready cutting operator, she would take this piece to the pattern table where the pattern plotter operator would print the pattern of collar and collar stand and give it to the ready cutting operator. Then the ready cutting operator would match the checks and cut the pattern using a rotary.

5.2. CUTTING COLLAR & COLLAR STAND ON CUTTING MACHINE

PROBLEM

The process of cutting collar and collar stand of checks garments manually was a very tedious process, the paper pattern had to be procured and cut using the rotary knife.

Fig: Block Cutting Collar

Fig: Print paper pattern

Fig: Rotary knife used to cut collar

Fig: Collar cut using rotary

SOLUTION

The collar and collar stand were cut on the cutting machine by aligning the checks with the projection of patterns on the machine bed. This increased the output from 10 pieces per hour to 40 pieces per hour and reduced the man power requirement.

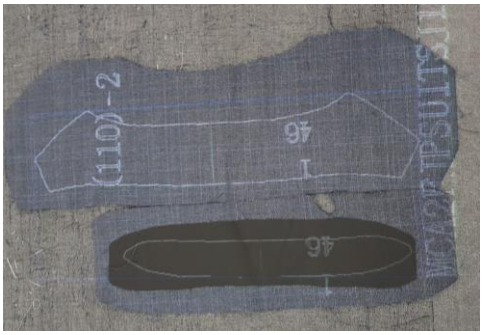


Fig: Matching checks with projection

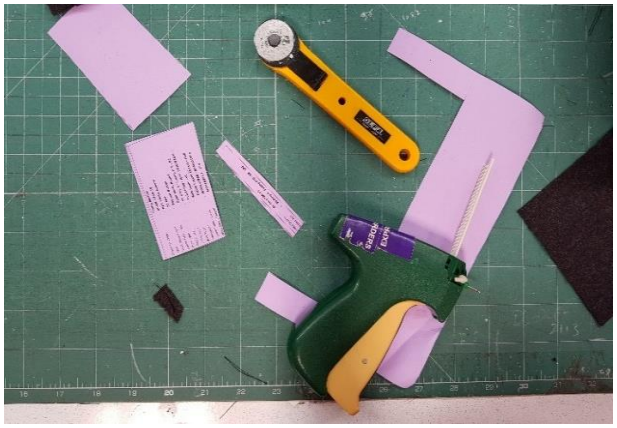
Fig: Cutting Collar Components

6. BUNDLING SECTION

6.1. REPLACING TAGGING PROCESS WITH STICKERING

PROBLEM

Track sheets were cut into 5 parts, namely, lining section, sleeve section, front section, collar section and back section using a rotary knife. This paper was then tagged with the respective part using a tagging machine. This time-consuming process created a bottle neck in the bundling section.



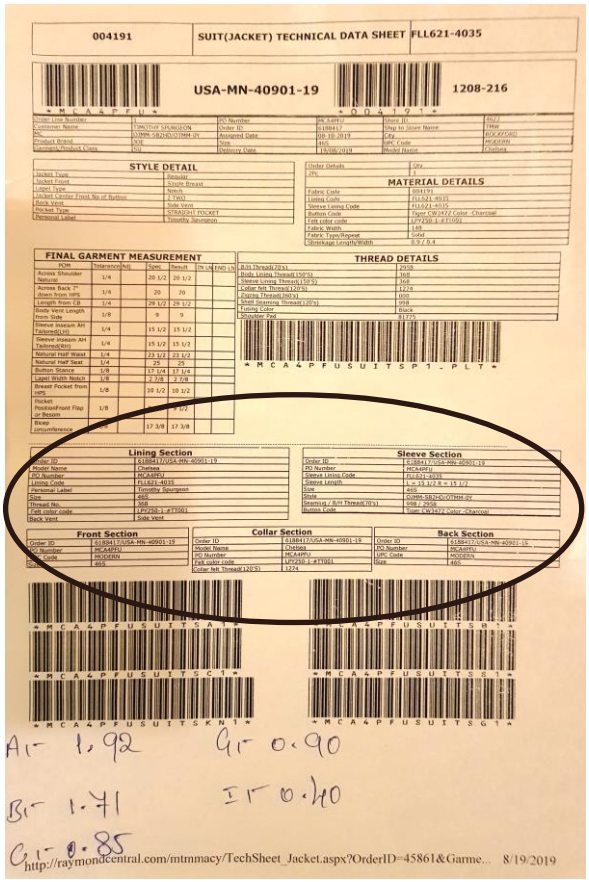


Fig: Tagging Process

SOLUTION

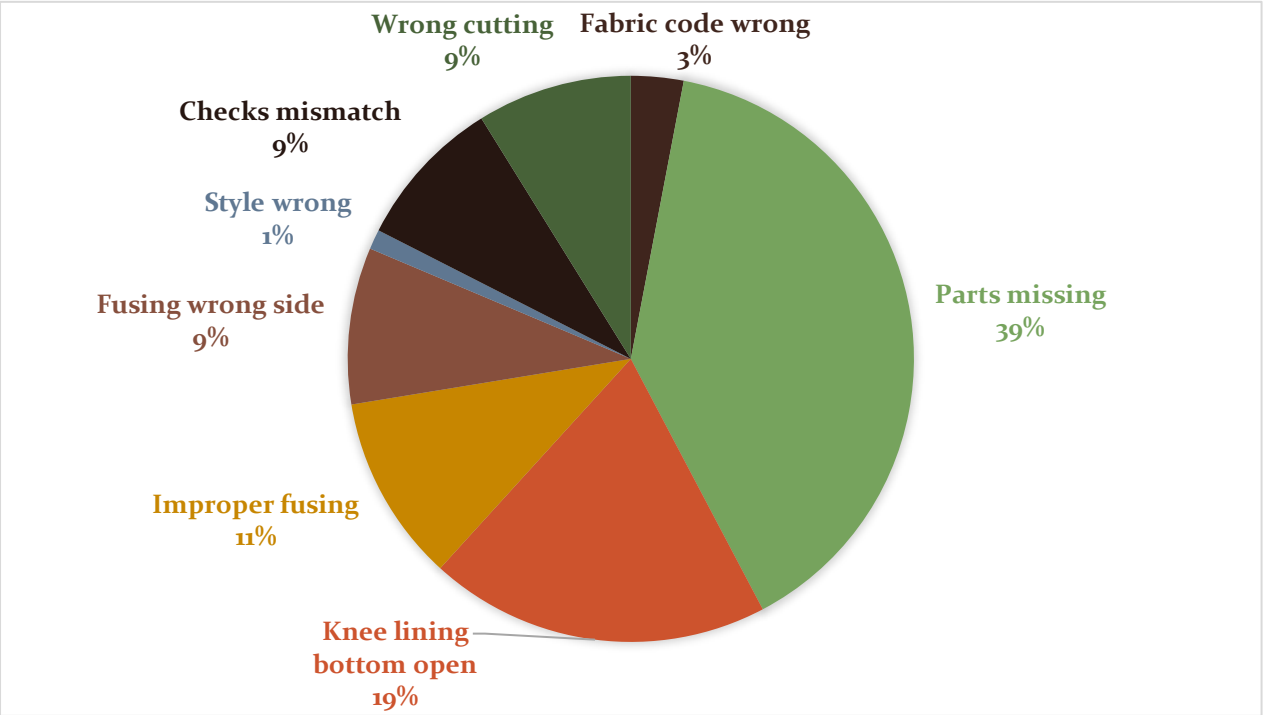
The tagging process was eliminated by a stickering process. Stickers were printed from the CAD department and provided to the cutting machine operators along with the tracksheet who could attach the stickers while picking the part from the machine bed.

Fig: Stickering Process

7. RECUTTING

The quality reports were compiled to the top 8 defects.

Day	Fabric code wrong	Parts missing	Knee lining bottom open	Improper fusing	Fusing wrong side	Style wrong	Checks mismatch	Wrong cutting
1.	6	40	23	10	8	3	12	10
2.	4	37	17	11	8	2	9	6
3.	5	29	19	13	6	0	7	6
4.	6	47	21	14	9	0	10	7
5.	4	62	16	15	5	1	11	11
6.	2	54	24	10	9	2	8	13
7.	3	48	18	9	12	1	9	10
8.	4	32	23	11	10	0	12	13
9.	0	38	26	13	11	0	7	9
10.	3	43	20	8	9	0	6	8
11.	1	47	18	9	7	1	11	13
12.	2	32	16	12	8	0	8	9
13.	3	39	19	11	11	1	6	12
14.	4	27	14	10	12	3	7	8
15.	2	40	23	13	10	2	8	6
16.	3	38	24	11	8	4	6	7
17.	0	34	19	8	9	0	10	5
18.	2	43	18	9	11	2	9	8
19.	5	40	17	12	7	1	9	11
20.	3	29	21	8	12	0	11	8



To find the causes of these defects root cause analysis was done.

Problem	1	2	3	4
Recutting	Parts missing at cutter	Lack of knowledge of parts	Lack of Training	Insufficient Time
				Pressure of order closing
		Negligence while picking the parts	Carelessness	No sense of ownership
			Pressure to increase production	Pressure to meet target
		Slow picking on GTXL-parts fall in bin	Lack of manpower	Absenteeism
			Lack of experience	Employees under training
		Fabric lifting messing lay on GTXL Machine	Machine design problem	Wear and Tear
	Parts missing at fusing machine	Parts stuck in fusing machine	Small Parts	Conveyor not able push
			Excess fusing not trimmed	Improper cutting
			Sticky Conveyor	Fusing stuck to conveyor
		Small Parts Fall Down	Gap between conveyors	Machine design problem
		Mixing of parts of different orders	Orders fused simultaneously	Large number of orders
				Unavailability of different fabric order
			Lack of knowledge of parts fused	New employees
				Inefficient training
	Fusing wrong side	Wrong face side marked at store	Face side mark missing	Negligence
			Marking after cutting causes errors	Not following procedure
			Pressure to increase production	Pressure to meet target
		Wrong face side marked at cutter	New employee	Inefficient training
			Pressure to increase production	Pressure to meet target
		Fusing operators don't check the mark	New employee	Lack of willingness to learn
			Carelessness	No sense of ownership
			Pressure to increase production	Pressure to meet target
	Checks matching problem	Incorrect Laying	Folding of fabric after laying	To create WIP for GTXL
			Folds in fabric	Negligence
		Bowing	Defective roll	Improper inspection
		Inability to match lower fabric layer	No pin table	Machine design problem
			Not able to match with grid	Inadequate skill set
				Pressure of increasing production
	Measurement Problem	Folds during spreading	Incorrect spreading	Inefficient training
				Pressure to increase production
		Wrong Marker Opened	Confusion regarding tracksheet	Bundle opened simultaneously
		Cutting outside fabric	Incorrect spreading	Inefficient training
				Pressure to increase production
	Felt Missing	Felt not added to tray at store	Negligence	Adaptation to new method
		Felt missed at cutting table	Negligence	Not picked up after cutting
				Adaptation to new method
		Felt missed at Ready Cutting Table	Felt missed while bundling	Large WIP
			Added to another bundle	Large WIP
	Shape Out	Improper spreading	Inefficient Training	Lack of time

			Negligence	Pressure to increase production
Recutting		Joint cutting	Blunt knife	Manually cut wrong
	Rash Cutting - RUK	Blunt knife	Wear and tear	Knife not changed
		Improperly spread polythene	Negligence	Pressure to meet target
		Fabric folds	Improper spreading	Negligence
	Rash Cutting - GTXL	Inability to adjust bowl pressure	Lack of knowledge	Inefficient training
				Lack of willingness to learn
		Improper bed	Wear and tear	Improper maintenance
	Selvedge in Parts	Improper spreading	Inefficient Training	Lack of time
			Negligence	Pressure to increase production
		Less cutable width	Improper roll	Inefficient inspection
	Improper Fusing	Fusing shape out	Cut wrong at cutter	Incorrect spreading
		Incorrect trimming	Work in haste	Pressure to meet target
		Gum side of both fusing face same side	Negligence	Working without concentration
		Pulling fabric	Joint cut	Blunt knife
	Fabric Thread Out	Rash cutting	Blunt Knife	Wear and tear
		Weaving defect	Improper inspection	Inefficient training
		Pulling fabric	Joint cut	Blunt knife
	Knee Lining Bottom Open	Improper Spreading	Inefficient training	Inadequate time
			Negligence	Pressure to meet target
	Fabric or Felt Wrong	Negligence at store	Large order quantities	Pressure to meet target
		Fabric Interchanged	Simultaneous bundle opening	Confusion
				Pressure to increase production
	Joint Cutting	Blunt knife	Non-replacement	Improper maintenance
		Rotary knife size diminished	Corrosion of knife	Wear and tear
	Checks Collar Cutting	Block patterns not available	Misplaced	Lack of knowledge
		Lack of skill	Inability to cut at cutter	Lack of training
			Inability to print pattern	Lack of training
	Short Length Fabric	Store	Measurement error	New employees
				Poor recollection
		CAD	Manual copying error	Negligence
			Entry on wrong tracksheet	Confusion due to more orders
	Marker Not Opening	CAD issue	Cut file not made	Missed due to many orders
			Cut file not opening	Too many files in folder
		Cutter issue	Typing error at cutter	Lack of concentration
			Barcode damaged	Tracksheet in bad condition
		Network error		
	Wrong Cutting due to Marker Wrong	Typing error at cutter	Illegible numbers	Damaged tracksheet
		Wrong track sheet	Simultaneous bundle opening	Large number of orders
			Confusion when cutting 3 pc suit	Many tracksheets
	Tracksheet Change	Confusion	Crowded workstations	Tables filled with large WIP
			Simultaneous bundle opening	Large number of orders
			Cutting 3pc suit	Many tracksheets

7.1. FABRIC CODE WRONG

The number of orders with fabric code wrong reduced drastically after installation of the board with fabric codes (refer 2.1.) in the sub-store.

7.2. PARTS MISSING

PROBLEM

About 100 orders per day had at least one part missing which had to be recut. This required time, manpower (2 operators for recutting) and resources (300 meters shell fabric per month) to be spent on non-value-added activities.

Parts were most often missed at the cutting machine bed as the projection would be changed with the marker of the next order. This made it difficult to identify cut parts.

SOLUTION

All the parts of the garments were being stickered with the last 3 digits of the purchase order number before laying the polythene and cutting the fabric.

	Problem	Solution
Cutting Machine	Not picked	Improved visibility even after projection turned off
Fusing Machine	Mixed between bundles of same fabric	Bundling operator would know which bundle the part belonged to
	Small parts fall from conveyor	Fuse small parts nearer to fusing machine
Material Movement	Fall from bundle	Know which bundle to return to

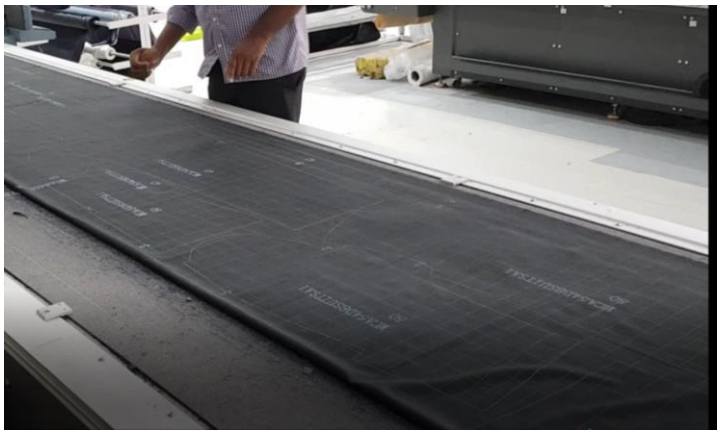


Fig: Before Stickering (Poor visibility of cut parts)

Fig: After Stickering

7.3. FUSING WRONG

PROBLEM

Numerous panels had to be recut due to fusing defects

SOLUTION

A board consisting of various fusible parts of a jacket and the placement of the fusing along with its type was displayed above every fusing machine. The display board was used to train new recruits and provided a reference to the operators.

Fig: Training Board for Fusing Operators

7.4. KNEE LINING BOTTOM OPEN

PROBLEM

The knee lining fabric is given a finishing along the selvedge to prevent unravelling. To keep this finish intact, the bottom of the knee lining is not cut, the fabric is laid such that the fabric remains above the line to be cut.

Sometimes the operators would negligently spread the knee lining such that the lower line of the knee lining would be cut on the fabric. This would result in the bottom of the knee lining unraveling. As a result of this, the knee lining would have to be recut.

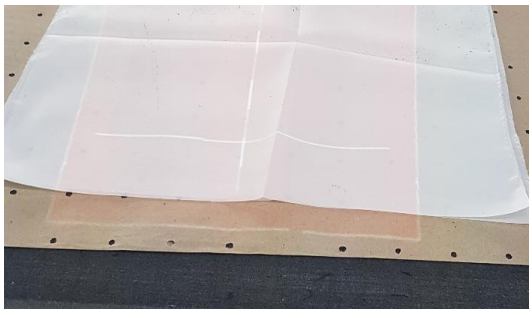


Fig: Bottom of knee Lining Fabric

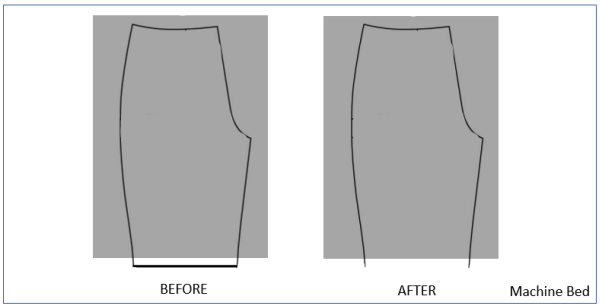


Fig: Modified Knee Lining Pattern

SOLUTION

After a meeting with the pattern department, the bottom line was deleted from the knee lining pattern. This eliminated the knee lining bottom open problem.

7.5. STYLE WRONG

PROBLEM

Three cutting machines did not have barcode scanners and operators would enter the purchase order number into the software manually. Occasionally, they would make a typing error which would result in the wrong marker being cut.

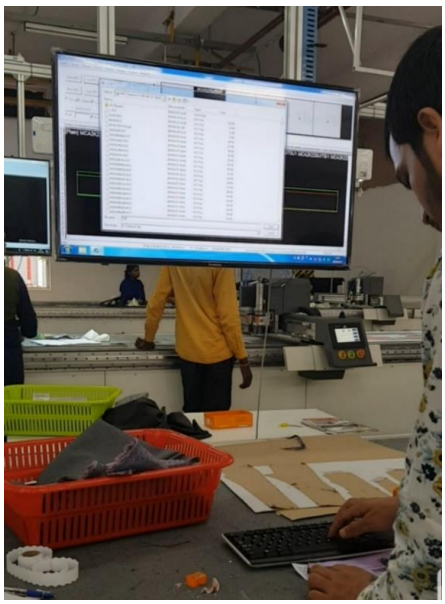


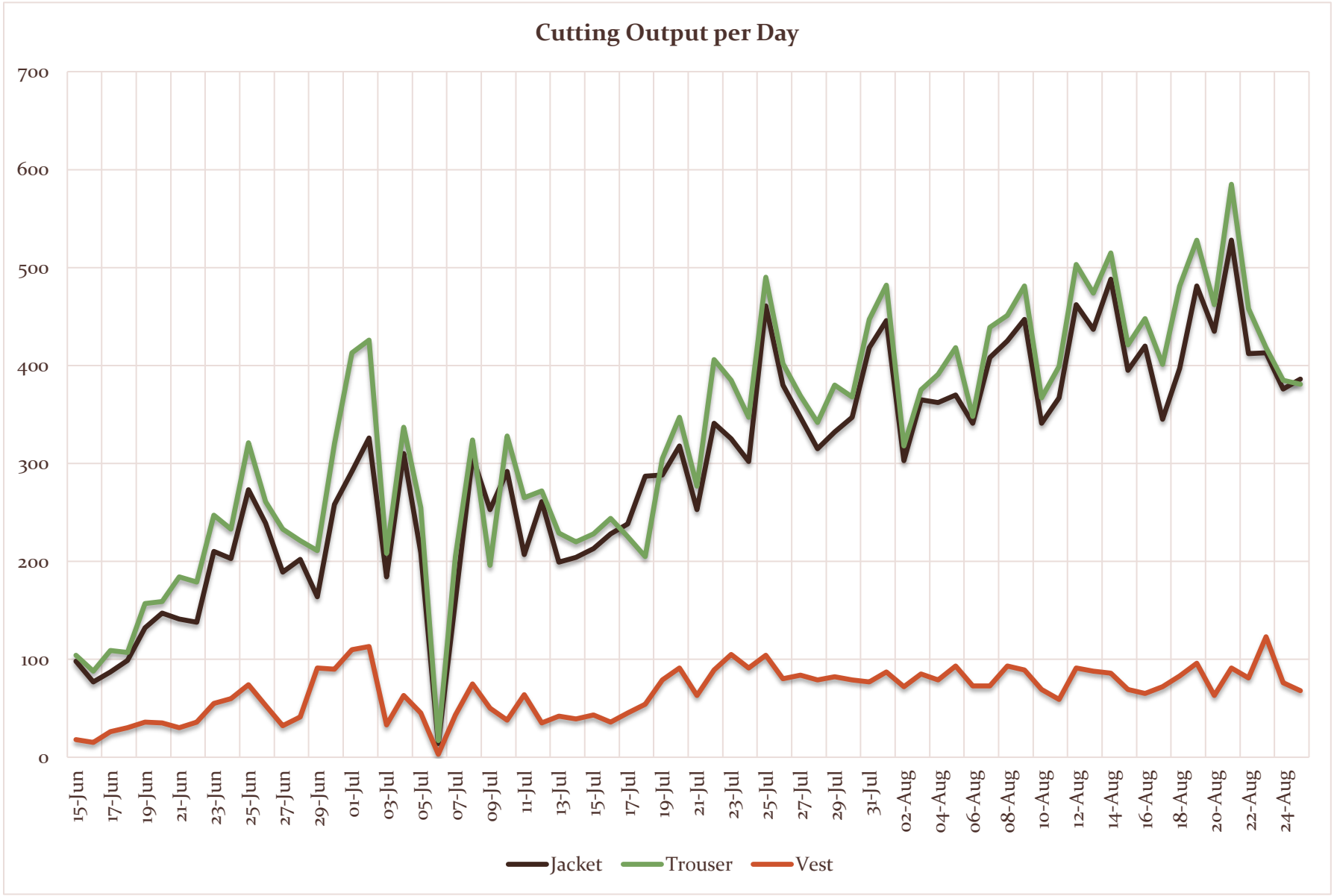
Fig: Operator typing the PO number

SOLUTION

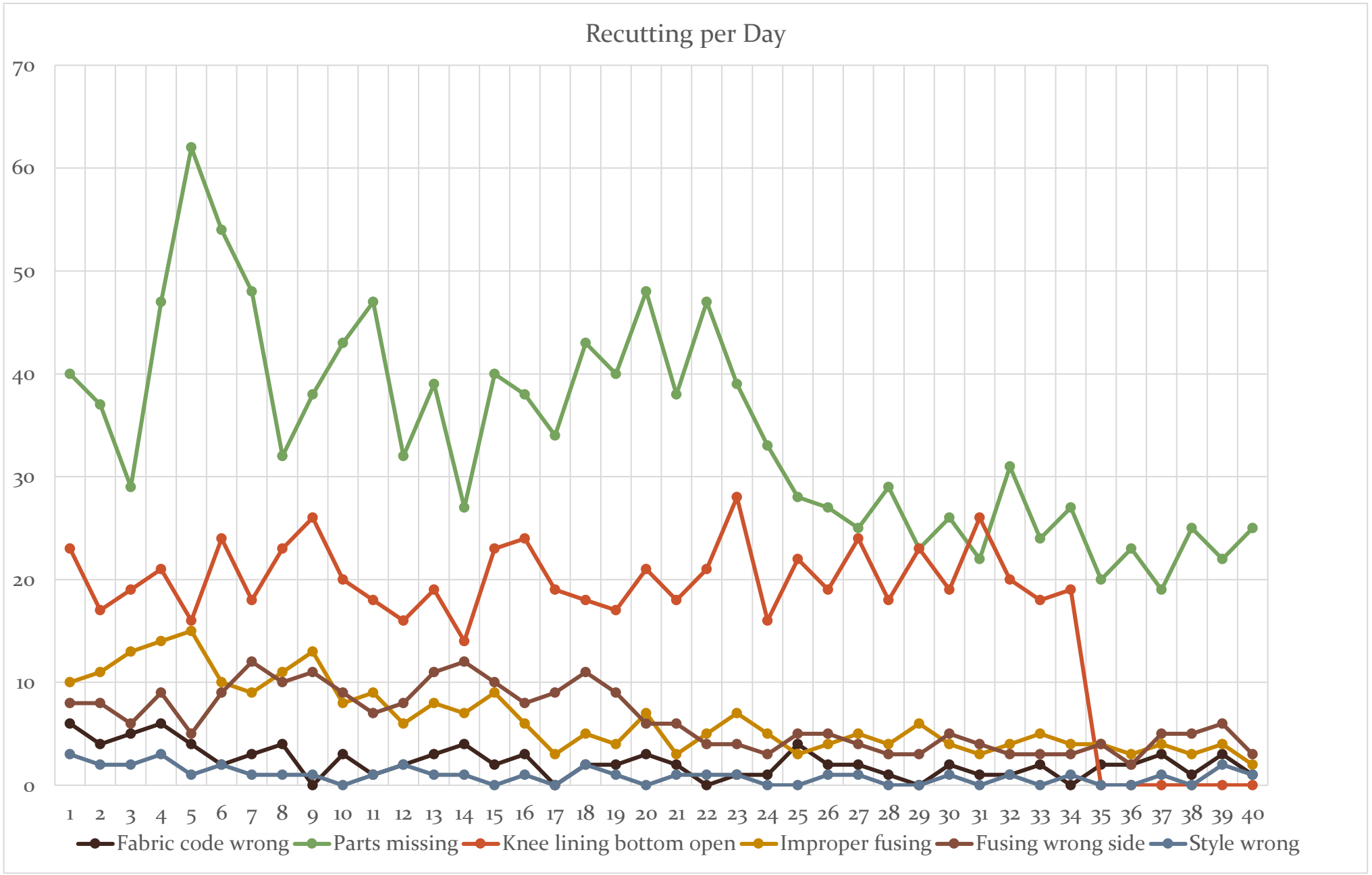
In order to mistake proof, the process of opening the marker, all cutting machines were provided with barcode scanners.

RESULT

1. OUPUT

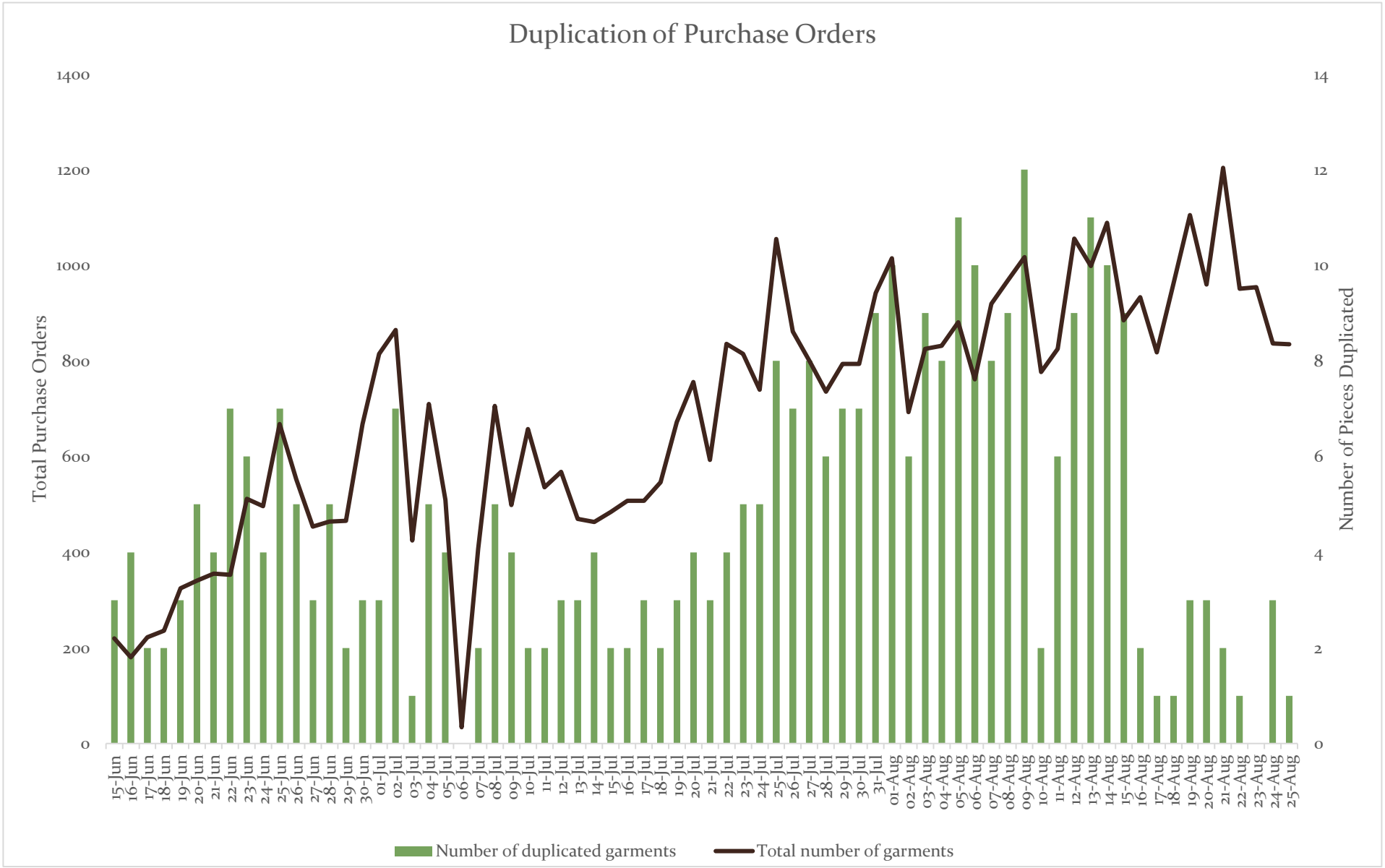


2. RE-CUTTING


Recutting per Day
70
60
50
40
30
20
10
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
Fabric code wrong
Parts missing
Knee lining bottom open
Improper fusing
Fusing wrong side
Style wrong

3. ORDER TRACKING

- Flexible daily reports
- Improved traceability
- Monitor operators
- Increased operator accountability
- Reduced duplication



4. MANPOWER SAVING

Before

- Tagging: 4/shift
- Ready cutting: 3/shift
- Counting: 4/shift
- Cutter: 4 operators/shift

After

- The tagging process was eliminated by using stickers to label parts on the cutting machine itself.
- The ready cutting of parts was reduced to only trouser facing and parts in which there was checks mismatch. The rest of the parts were cut at the cutter.
- The counting process at the bundling table was eliminated by giving responsibility to fusing operators for counting shell fabric and cutter operators for counting lining fabric
- The number of operators on each cutter was reduced to 3 operators per machine from 4.

5. COST SAVING

- Salary of Operators
    - Salary per month = 15 operators * 7000 Rs/per month = Rs. 1,05,000/mo
    - Savings per year = Rs. 12,60,000 /year
- Tagging
    - Tag guns & pins = Rs. 4000/mo
    - Savings per year = Rs. 48,000/year
- Cutting Machine Blade
    - Cost per knife = Rs. 750
    - Breakage per day = 3 times
    - Cost per month = Rs. 68,000/mo
    - Savings per year = Rs. 6,16,000 /year