Implementation of Quality tools in Suit manufacturing to avoid Customer Returns

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Abstract

Garment Manufacturing is becoming more and more technology driven in an ever growing competition across the Globe. Quality being one of the most important criteria for acceptance by the consumers, companies cannot take any casual approach towards achieving quality. Poor quality is detrimental to the image of the company and impedes the economical growth of the company. Time taken to repair the defects provides space to the competitors and not all types of defects are repairable. Wrong assumptions about reparability can give "shocks" when the shipped products come back as "Return". Men's suit is a category of apparel that is highly structured in comparison to other garments like T Shirts, Shirts, Tops, and Jeans etc. Technological requirements are also high in this category due to the required precision in the end products. This paper is a practical study where quality issues are analyzed in a suit manufacturing company and then some very effective quality tools are implemented to overcome the defects to establish the idea "Right first time". Percentage of defects is actually reduced, thus cutting down the cost incurred due to bad quality.

Key words*: Quality problems, quality awareness, quality training, quality tools, quality implementation, reducing defects, cutting costs.*

Introduction:

For every manufacturing company, maintaining an acceptable quality level is necessary, particularly for export industry quality becomes even more important a criteria for acceptance by the consumers and certain standards need to be followed. Apparel business is a global business and manufacturing companies are concentrated in countries like China, Bangladesh, India, Vietnam, Philippines, Sri Lanka etc. mainly. India , as mentioned , is one of the major supplier to the rest of the World. For apparel manufacturing, quality and productivity need to be taken care of since the time of procurement of raw materials through the dispatch or shipment. Quality has to be built in such a manner that post shipment returns and internal rejections both are minimized to a very miniscule level. Rather the idea should be that of "Zero defects" .Any slackness to maintain good quality or to follow a perception that Garments are soft, non- engineered products and cannot be produced without generating defects is detrimental towards achieving commendable quality through the whole lot of output. Raw materials, workforce, machineries and equipment, methods, layout, technological intervention all are constituent parts for achieving a certain level of quality. All these factors need to be in sync with the quality philosophy of the company, weak areas need to be analyzed very carefully and must be addressed on time. In this study, quality system of one Men's Suit manufacturing company is observed and it was found that the initial defect percentage was as high

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as 7.1% which is reduced to 4.3% by the end of 8 week's study and which contributed to cost cutting and to achieve a quicker response time. Total study period is of 12 weeks during which a big part of the study is dedicated to devise SOP and other corrective tools . Multiple tools of "Total quality management" are applied in practice to achieve the results.

Objective:

Main Objective of the study is to implement the idea of "Right first time" in a Men's suit manufacturing company by employing certain quality tools within a period of 12 weeks and to establish a clear cut cost benefit thanks to reduction in quality defects. Secondary objectives of the study are establishing a standard operating procedure for the manufacturing process and to provide the workers with visual guidance so that confusion regarding product sequence and assembly are avoided.

Methodology:

The study is mainly based on secondary data collection followed by primary observation and data collection through the complete production process in a Men's suit factory. All the sections of manufacturing like product development, cutting, sewing and finishing are observed to understand the points where defects get generated .Brainstorming among the responsible factory persons and the observance on a day to day basis are other effective tool used . Based on the primary data collection, established quality tools are employed wherever necessary. Quality tools are studied in published books and the practical use of the tools are studied in published journal papers. Visual tools are provided for simple and effective understanding of the workforce.

Literature survey:

Looking at the objective of reducing defect percentage and establishing the idea of "Right first time" we did required literature review to gain appropriate knowledge of quality tools and their applications in industry. Also we reviewed published papers in various journals where similar type of problems were seen and subsequently were overcome after intervention of quality tools were done.A list of the reviewed topics are explained below:

Right first time

Lean manufacturing significantly puts stress on the concept of "Right first time" The principle of "Right first time" does not allow buffer to fall back on if there is a quality problem in the manufacturing line. It is in favor of shutting down the whole process the moment equipment shuts down. Signal is generated to show that there is some issues and the line had to stop. Flags or lights usually accompanied by alarm or music go off. This signaling is known as "andon" in lean manufacturing and also means "light signal for help". (Jeffrey K. Liker)

Pareto analysis

Pareto chart is one of the seven statistical quality control tools. This tool helps where one needs to separate the important from the trivial. The chart is named after Italian Economist/sociologist Vilfredo Pareto (1848-1923) . He recognized the fact that a minority of causes lead to majority of problems and looking at the constraint of sources, it is wise to apply the resources to the area where they are needed more. **Cause and effect diagram** is another one of the seven SQC tools that helps in quality control. This diagram, also known as fishbone diagram, was developed by Dr. Kaoru Ishikawa. This chart is a very simple way of

representing various possible causes of a problem. The name fishbone diagram is given as it appears to be a fishbone visually.(Goetsch and David).

Why -why analysis

As an integral part of "Kaizen" Toyota's why- why analysis is a very useful and effective tool of fact finding by asking "Why" for five times. Each time "why " is repeated it digs deeper and finds to ascertain the real cause of quality problem. This analysis recognizes the fact that the cause of problem lies hidden beyond the source. (Jeffrey K. Liker)

Garment defects and their causes

Garment defects may creep in at raw material stage itself if not monitored consciously. Defects arising during processes also contribute to quality problems which accumulates to be revealed during the final checking of the garments. Sewing is the part of garmenting process where the products are manipulated for the longest time and hence possibility of defect generation is also high. It is imperative to understand the types of raw material and process defects both and the causes of them, too. Monitoring from raw material stage to the final finished garments helps in preventing shocks in final stage. A visual defect library is a big help in understanding the defects. In process or in line inspections are followed by end line or final inspection where all specifications are checked and documented to understand the tendency and occurrence and the documented reports help in avoiding defects in future and in saving cost.(Mehta)

Standard operating process

A standard operating procedure or SOP, is a set of step by step instruction, compiled by an organization to help workers carry out complex routine operations. SOPs aim to achieve efficiency, quality output and uniformity of performance, while reducing miscommunication and failure to comply with Industry regulations.ISO series 9001-2015 essentially requires the determination of processes documented as SOP used in any manufacturing process that could affect the quality of the product.(ISO 9001-2015 series)

Visual controls

Use of visual control is the most important step in the process of developing standardization. All the specification, procedure and requirements within every work area is impossible to keep in mind all the time Visual control defines the standard and helps in quick recognition by the concerned people, simplicity in understanding helps people to adhere to the desired standards and thus avoids variations in the process. It helps new employees also and reduces dependence on a certain group of people within the organization.(Liker &MEIER)

The practical study in a suit manufacturing company :

The study, as mentioned earlier is carried out in a Men's suit manufacturing company that supplies its products to U.S., Canada and Mexico mainly . The company was facing problems of rework due to quality defect generations in the sewing sections, thread trimming , fusing and even fabric damage. One Jacket sewing line is studied for one whole month to see occurrence of defects in various stages. To avoid accumulation of defects at the end, inspection is carried out during the process and at the end of completion of garments both. Garments are divided in three zones , namely A,B & C zone for inspection purpose. "A" being the most visible most important from quality point of view ," B" less visible than A zone while " C" zone is the hidden parts of the garments. Sewing operations in jacket having 114 different

operations ,are carried out in four different sections, namely: Front & back section, Sleeve section , lining section and the assembly section where the semi stitched parts are assembled together and this line is also referred as the **Endline** as the End line inspection takes place after all the operations are done in this section, that is the culmination of jacket assembly. Defect data is gathered by working with the quality checkers practically and in process and end line audit format entries are analyzed to see the percentage of occurrence and defect per hundred units (D.H.U.) for further analyzing the root causes of particularly the higher occurred ones. Table 1 shows the defects occurred during the one month period in the end line inspection.A total of 6550 jackets are inspected and 466 pieces are found carrying various types of defects.

Table 1 shows the highest occurred defect at the top and subsequently the other defects are shown as the descending order of occurrence. Order of occurrence of the defects are found when the observed data is plotted in a Pareto Diagram.

Table 1:

Name of Defect
Fusing Mark
Vent stitch open
Fabric Damage
Fit label missing
Armhole lining lock open/missing
Keyhole missing/open/uneven/broken
Weaving defects
Armhole open/jump/uneven stitch
Wash care label open
Sleeve hem open
Main label missing/cross
Pocket bag open
Sleeve Elbow/Inseam open
Sleeve cuff open/Button missing
D/1 bar tack missing/open
Vent up and down
Armhole stitch visible
Stain
Lapel point open/jump stitch
Collar zigzag open/broken/open/jump stitch
Side seam open/loose stitch/puckering
Lapel shape out
Front to Front up and down
OBW PKT ZIGZAG
Flap uneven/open
Pick up and down
Size label wrong/missing

As is evident from the above table, Fusing marks, Open vent stitch, Fabric damage, Missing fit label, armhole lining lock missing/ open are the top five defects and they are found to be contributing almost 50% to the list of defects. The high repetition of these defects calls for further scrutiny immediately. Cause and effect diagrams are made for these five defects and then again why-why analysis of the probable causes are done to find out the root causes.Table 2 shows the causes for the top five defects mentioned above:

Table 2:

Defect	Causes
Fusing Mark	1.Mishandling of fusible over the cut panels Unclean workstation
	2.Worker ignorance about fusing
	3.Machine temperature, pressure and time not set correctly.
Vent stitch open	1. Blunt needle
	2. Loose tension
	3. Weak thread
	4. Absence of back tack after alteration.
Fabric damage	1. Presence of sharp tools or objects
	2.Faulty feed dog
	3. Improper trimming of thread
Fit label open or missing	1. labels not fed on time
	2.High alteration rate
	3.Improper thread trimming
Armhole lining open	1. Loose tension
	2.Wrong SPI (Stitch per inch)
	3. Back tack not done after alteration.

The above five defects are very visible due to their high occurrence but the list of total defects is much longer. Similar type of analysis is done in other sections of the jacket manufacturing lines namely, Front back, Sleeve & Lining sections. The complete analysis clearly shows that the causes for defects are mainly: lack of knowledge/ training, absence of communication, unclean or less maintained workplace, lack of clearly instructed methods / process, bad selection of auxiliaries/ trims, late detection of faults etc. Ascertainment of causes underlines the need for worker training, visual instructions, video instructions, signal generations, well documented standard operating procedure. During the study all these remedies are tried practically and finally positive results are achieved. The implemented solutions are following:

Visual instructions:

To make the things clearer real size mocks are developed in fabric. Since the fabric mocks are three dimensional, they are capable of clarifying the shape and measurements both. In the example below shown in figure 1, one 2- piece notch collar is developed where the vital check points are written clearly. In the figure 2 specifications for

trimming the edge of chest piece is shown with the help of mock sample and written instructions as well.In the same way, mocks are developed for other critical operations for easy understanding.

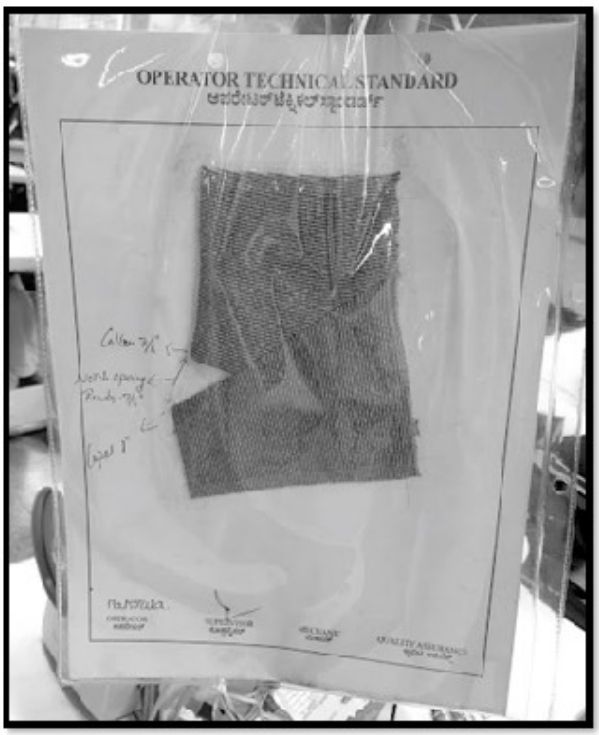


Figure 1

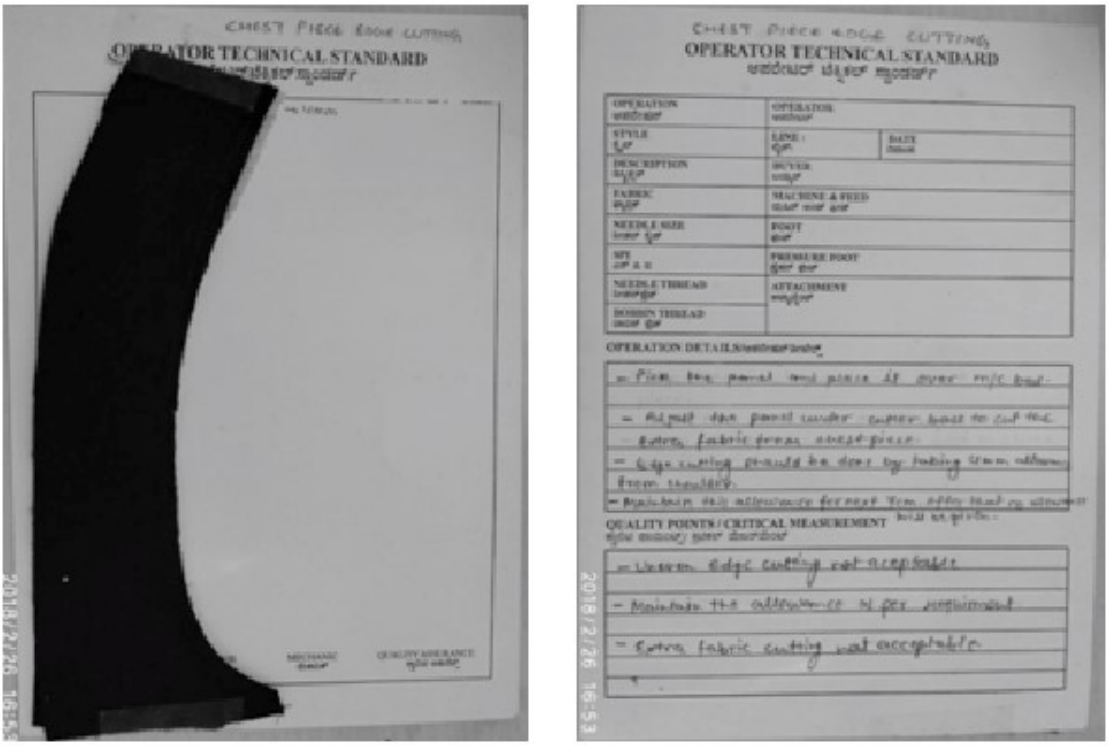


Figure 2

Visual quality posters to create awareness:

Various types of quality posters are implemented in the factory to give a sense of responsibility towards maintaining quality. Figure 3 and 4 are shown as examples.

Figure 3

Figure 4

Traffic light signals are: These are signals showing three different color lights , Green for no defect, red for 1 defect and yellow for a new operator who needs more monitoring. Each hour five random samples are inspected even if only 1 defect is found, red signal is assigned to the worker, the work is stopped, piece is repaired and then starts again. This is done to avoid aftershocks and to flag the problem in a very visible manner. If there is no defect green card is shown. No worker wants a red signal and is careful. More defects lead the quality department to dig deeper to find out the problem with the specific worker(s).

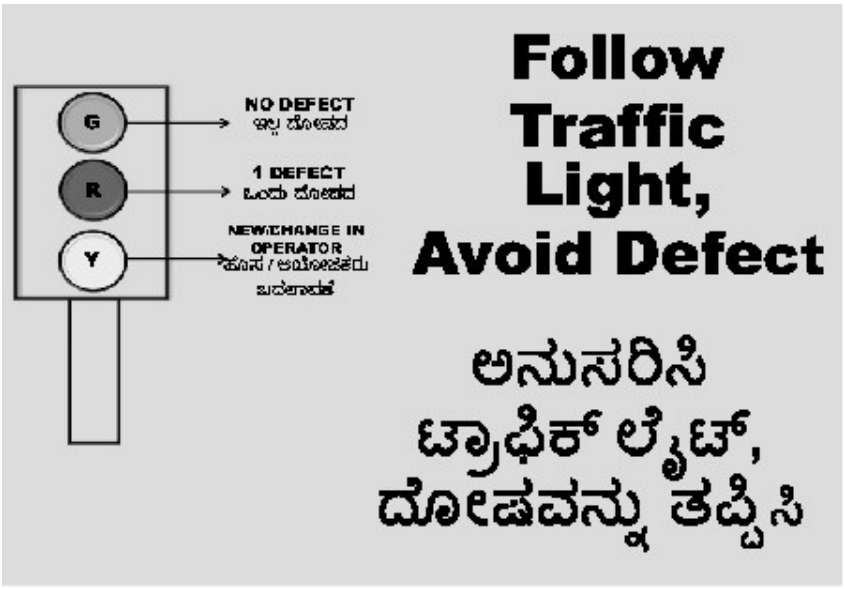


Figure 5

Video instructions for quality checking:

Videos were made for the quality checkers to follow correct method of checking. Mainly they are instructed to avoid backtracking during the checking.Checking is done in such an order that each point in one section is inspected and then it goes to the other section and so on.One section is checked thoroughly so that the checker does not come back to the checked section again and again.

Defect library:

A defect library is made and displayed for helping the workers. Figure 6 and 7 show the same.

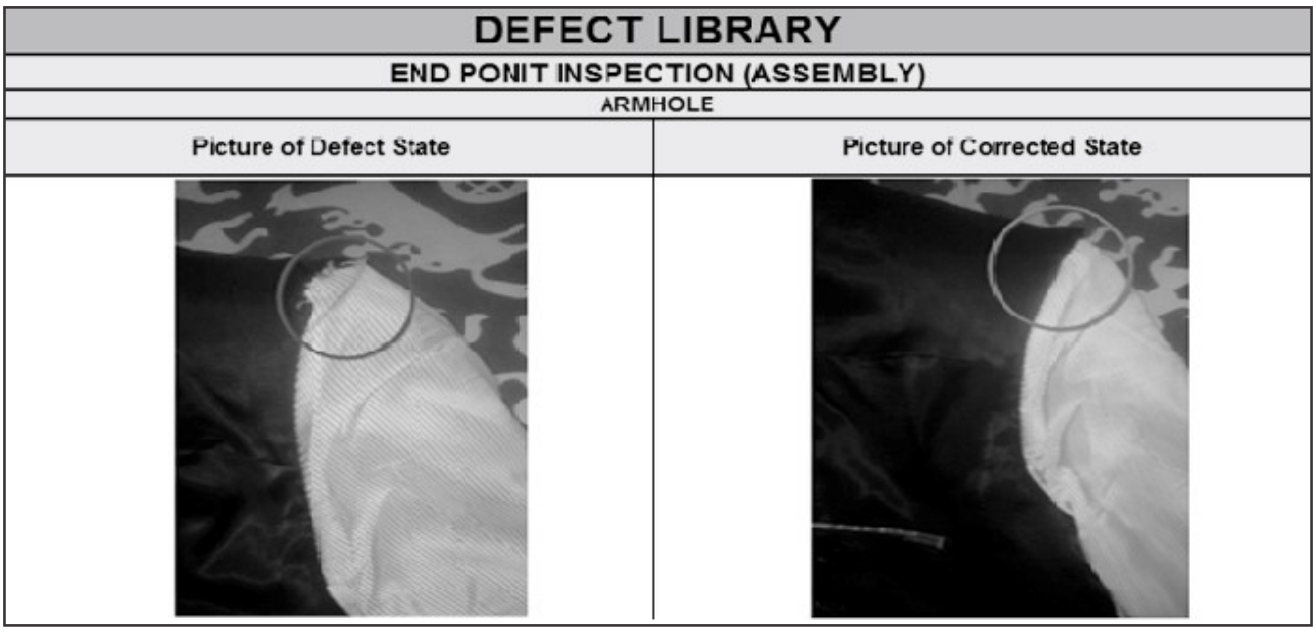


Figure 6

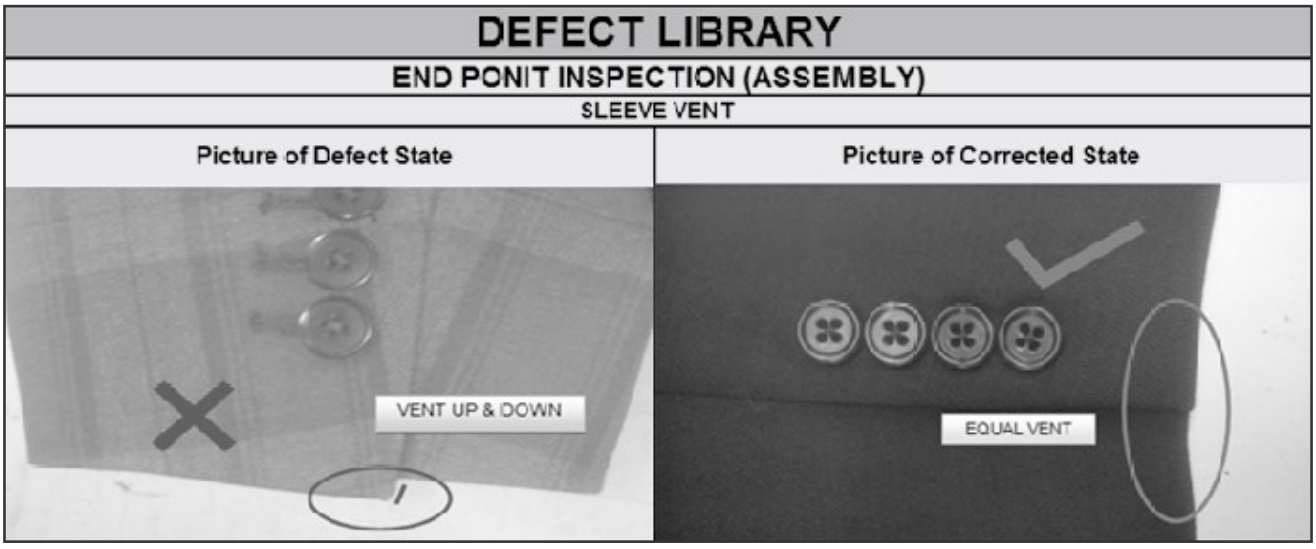
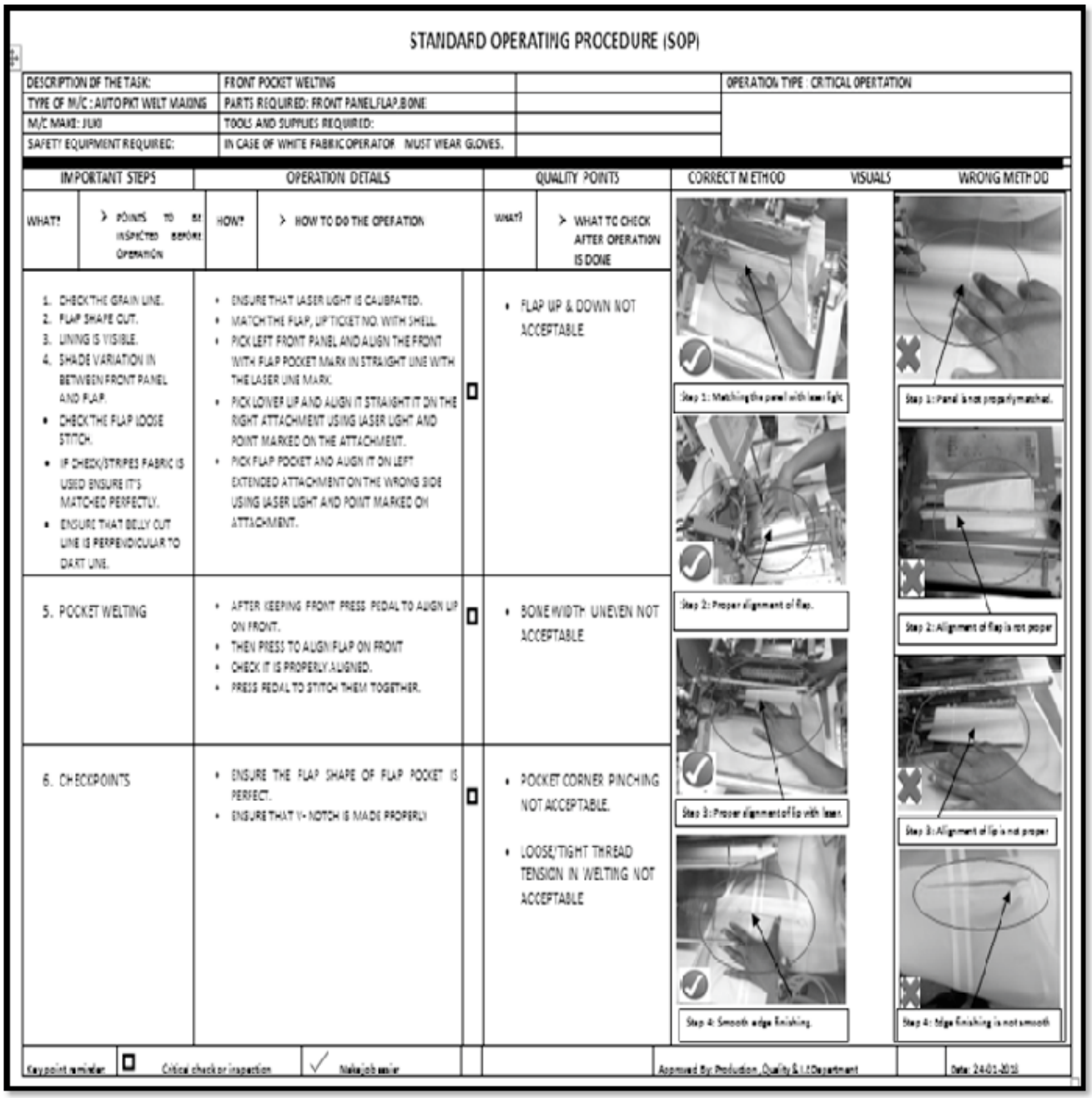


Figure 7

Standard Operating Procedure :

Standard operating procedure is developed with written instructions combined with visuals of step by step development of work. The figure 8 shows the SOP developed in the company.



STANDARD OPERATING PROCEDURE (SOP)

DESCRIPTION OF THE TASK:	FRONT POCKET WELTING		OPERATION TYPE : CRITICAL OPERTATION
TYPE OF M/C : AUTOPKT WELT MAKING	PARTS REQUIRED: FRONT PANEL,FLAP,BONE		
M/C MAKE: JUKI	TOOLS AND SUPPLIES REQUIRED:		
SAFETY EQUIPMENT REQUIRED:	IN CASE OF WHITE FABRIC OPERATOR MUST WEAR GLOVES.		

IMPORTANT STEPS		OPERATION DETAILS			QUALITY POINTS		CORRECT METHOD VISUALS WRONG METHOD
WHAT?	> POINTS TO BE INSPECTED BEFORE OPERATION	HOW?	> HOW TO DO THE OPERATION		WHAT?	> WHAT TO CHECK AFTER OPERATION IS DONE	
1. CHECK THE GRAIN LINE. 2. FLAP SHAPE CUT. 3. LINING IS VISIBLE. 4. SHADE VARIATION IN BETWEEN FRONT PANEL AND FLAP. • CHECK THE FLAP LOOSE STITCH. • IF CHECK/STRIPES FABRIC IS USED ENSURE IT'S MATCHED PERFECTLY. • ENSURE THAT BELLY CUT LINE IS PERPENDICULAR TO DART LINE.		• ENSURE THAT LASER LIGHT IS CALIBRATED. • MATCH THE FLAP, UP TICKET NO. WITH SHELL. • PICK LEFT FRONT PANEL AND ALIGN THE FRONT WITH FLAP POCKET MARK IN STRAIGHT LINE WITH THE LASER LINE MARK. • PICK LOWER UP AND ALIGN IT STRAIGHT IT ON THE RIGHT ATTACHMENT USING LASER LIGHT AND POINT MARKED ON THE ATTACHMENT. • PICK FLAP POCKET AND ALIGN IT ON LEFT EXTENDED ATTACHMENT ON THE WRONG SIDE USING LASER LIGHT AND POINT MARKED ON ATTACHMENT.	☐		• FLAP UP & DOWN NOT ACCEPTABLE	Step 1: Matching the panel with laser light. / Step 1: Panel is not properly matched.
5. POCKET WELTING		• AFTER KEEPING FRONT PRESS PEDAL TO ALIGN UP ON FRONT. • THEN PRESS TO ALIGN FLAP ON FRONT • CHECK IT IS PROPERLY ALIGNED. • PRESS PEDAL TO STITCH THEM TOGETHER.	☐		• BONE WIDTH UNEVEN NOT ACCEPTABLE	Step 2: Proper alignment of flap. / Step 2: Alignment of flap is not proper
6. CHECKPOINTS		• ENSURE THE FLAP SHAPE OF FLAP POCKET IS PERFECT. • ENSURE THAT V- NOTCH IS MADE PROPERLY	☐		• POCKET CORNER PINCHING NOT ACCEPTABLE. • LOOSE/TIGHT THREAD TENSION IN WELTING NOT ACCEPTABLE	Step 3: Proper alignment of flap with laser. / Step 3: Alignment of flap is not proper
						Step 4: Smooth edge finishing. / Step 4: Edge finishing is not smooth

Key point reminder ☐ Critical check or inspection ✓ Make job easier — Approved By: Production, Quality & I.E Department — Date: 24-01-2018

Figure 8

Maintaining a fix schedule for checking needle and tension of thread:

Since damage caused by blunt needle and loose tension of sewing threads are very evident and are among the highest occurring defects , workers are trained to check needle points after each 15 minutes very quickly and tension of sewing threads is checked at the beginning of sewing and whenever there is a change in needle/ sewing thread. Each machine is cleaned around the feed area for checking any oil spill. To avoid stains

imparted by worker's palms, white gloves are introduced and it is checked practically that they do not hinder the speed of sewing. The ready pieces are packed in temporary poly packaging just after the process of making is finished.

Conclusion and results: After the above mentioned measures are implemented as an ongoing process, quality checking reports are also gathered each week and after the eight week period, it was seen that in a total sample of 6000 pieces the number of defective pieces came down to 260, that is 4.33%.Alteration rate, too, is reduced and cost saving is done due to less wastage of resources. Workers reported ease of work due to visual guidance.

Further scope of the study: In the limited period of study the defective pieces came down significantly but there is a further scope of bringing down occurrenceof all types of defects if the Philosophy of quality is built within the organization from top to bottom and workers are given more ownership of their own part of work

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