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Sonargaon University [SU]
সোনারগাঁও ইউনিভার্সিটি (এসইউ)

Project Report

On

"Major Defects Analysis in Garments Industry through Pareto Chart and Six Sigma"

DEPARTMENT OF TEXTILE ENGINEERING
PROGRAM: B.Sc. IN TEXTILE ENGINEERING

Course Code: TXE-441

Course Title: Project.

Semester: Summer, 2021

Supervised By:
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Lecturer & Coordinator
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Letter of Transmittal

Date:
To
Kamrul Hassan Bhuiyan
Lecturer & Coordinator
Department of Textile Engineering
Sonargaon University **(SU)**

Subject: Submission of Project Report.

Dear Sir,

I am feeling honor to present my Project Report on **"Major Defects Analysis in Garments Industry through Pareto Chart and Six Sigma"** before you. I was assigned to perform this task as a part of my B.Sc. program. To prepare this report I have conducted interview with the official"s and collect my required data, papers and documents etc. I have completed my project report. I gathered the information what I believe to be most important & necessary for the preparation of the report.

I therefore, pray and hope that, you will appreciate me with any sort of recommendation & valued suggestion and will cordially receive this project for your kind assessment.

Sincerely yours,

Section	**ID**	**Name**
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Approval of Project Report

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Declaration

We are declaring that this is a project thesis report is submitted for fulfillment of the requirement of BSc in Textile Engineering Degree of Sonargaon University (SU). 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

First, I would like to thank the Almighty **ALLAH** for giving me strength and ability to complete this project report successfully.

A number of people have make significant contribution in my project and preparing this report, their insights, advice and suggestion helped with me a lot.

I am grateful to my academic supervisor **Mr. Kamrul Hasan Bhuiyan**, Lecturer, Department of Textile Engineering, Sonargaon University for his support, suggestion and proper management and guidance.

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Abstract

Bangladesh is a developing country and 83% of the foreign currency comes from the garment sector. Garment export business is a vital issue for our country. To upgrade the position in the ranking and make the position strong in the world contest, we have to compete with world class competitors with maintaining 100% quality. So, we have to ensure that our production processes are the best and always in continuous development and also capable of producing best quality product. This project work represents a study on defects in the sewing lines of a garments factory by Pareto chart, cause effect diagram and six sigma to find out the major defects and their percentage and also find out the defect standard level with the help of total amount of defects per million garments. It is studied in "Talisman Limited" which is a 100% export oriented woven garment factory. The work has been done in the sewing section for our project purpose and data of two months" has been collected to analyze the defects by Pareto chart and identify six major defect positions where 78.66% of total defects occur. After that we worked in separate line to find out the defect condition. We observed sewing defects in case of Women Blouse. After Pareto analysis, it was analyzed 6 common major defects and causes of these defects. Then it was shown by cause effect diagram and given some recommended remedies for these causes. After analysis sigma level has been determined through sigma calculator and level was 3.3 for two production lines, where women blouses were being sewed.

Keyword: Cause Effect Analysis, Defects, DPMO, Pareto Chart, Quality, Sigma Calculator.

Chapter-1
Introduction

Introduction

The garments industry has played a vital role in developing the socio economic condition in Bangladesh [3] [4]. Despite of its modest beginning in 1970s the apparel industry in Bangladesh has grown to become one of the largest contributors to the export revenue of the country representing its total exports [3]. Moreover the apparel industry also contributes around 83% of country's export earnings of Bangladesh. Being the single largest employer in the manufacturing sector, the apparel industry provides at least 20 million of Bangladeshi's employment directly as well as indirectly. The quality of garments is vital to its survival in an increasingly competitive apparel industry in order to maintain the production of high quality garments and improved productivity in the apparel industry [1] [7]. As the world economic condition is changing in a rapid motion. Generally in an industry more focus is given on profit margin, customer demand for high quality product and improved productivity. In garment manufacturing, it is usual that there will the few rejected garments after shipment. Reasons are most of the manufacturers believed that garments are soft goods and non-repairable defect may occur due to low quality raw materials or faulty process or employee casual behavior. There is no ready-made solution that can reduce defect percentage overnight [2] [7]. But this paper work suggests how to handle such problems and bring down defects rate to minimum with quality production. As we see a lot of defective garments after shipment, most of the organization termed these garments as rejected because those garments can't be repaired by any means [5]. Defect in the garments industry is a common phenomenon that hampers the smooth production rate and focus on poor quality products having an impact on overall factory economy. Minimization of defects is a must in quality and productivity improvement. Rework is a vital issue for poor quality product and low production rate [1]. Reworks are the nonproductive activities focusing on any activity that customers are not willing to pay for. Nonproductive activities describe that the customers does not consider as adding value to his product. By reacting quicker in minimization of reworks to make a product as per customer demand with expected quality, the company can invest less money and more costs savings [1][8]. Therefore, a study was carried out in the garment industry named “Talisman Limited” in sewing section to identify defects so as to eliminate them for saving time, cost and improved product quality.

Chapter-2
Literature Review

A large number of studies have determined major quality improvement tools According to (Mazedul, Maroof, Mashiur)[11] their paper discusses the quality and productivity improvement in a manufacturing enterprise through practical study. This paper deals with an application of methodology in an industry which provides a framework to identify and eliminate sources of variation in an operational process, to optimize the operation variables, improve and sustain process performance with well-executed control plans. The application of the paper also improves the process performance of the critical operational process, leading to better utilization of resources, decreases variations & maintains consistent quality of the process output. The outcome of this observation reflected that an industry may gain higher productivity and profitability with improved quality product by minimizing reworks activities. It also minimizes cost and improves internal throughput time. Finally a general overview over this development is given. Matthew[12] stated that strong understanding of Six Sigma management philosophy, concepts, and practices and to apply this knowledge to creating a Six Sigma academic course or training program. This was done through three main methods: preliminary research and data collection, the creation of a design model for Six Sigma academic course/training program establishment, and the creation of a Six Sigma academic course/training program syllabus. Jeannine[4]also focuses on the joint use of popular improvement initiatives of Six Sigma. This report contains a brief summary of initiative and then outlines the connections between frameworks commonly used in Six Sigma process areas (Steven, 2007)has make recommendations that would improve the performance of six sigma within the ford motor company. Peter[13]stated that a longitudinal case study describing the evolution of „Six Sigma Management" at Siemens in Sweden. The success of the programmer was to a large degree built on previous failures, confirming Juran"s old saying „Failure is a gold mine". From the case study, success factors for implementing Six Sigma at Siemens are identified and compared to those given in the literature. The evaluation of sewing threads consumption in Women Blouse clothing six different input parameters are chosen and used for investigation. To objectively evaluate their contributions, a Taguchi design analysis was applied. Jaouachi,[9] ,the research methodology concentrates the implementation of cause and effective diagram are used for eliminating garment defectives. Many of the SMEs are not aware of six sigma and many do not have the resources to implement six sigma projects. It was also found that lean sigma was not generally popular among SMEs. Management involvement and participation, linking six sigma to customers and linking six sigma to business strategies are the most critical factors for the successful deployment of six sigma in SMEs according to Christian [9]. Quality Improvement can play a vital role for improving productivity as well as economic development for the country. They have used the tools of TQM such as Flow chart, Check sheet, and Histogram, Pareto Chart, Scatter Diagram, Control Chart, Cause and effect diagram in a garment industry of Bangladesh and it is found that a significant amount of rework and scrap per style, per month has minimized by applying this method Rahman, [7]. Conducted to improve efficiency of the sewing process in apparel industry through the reduction of defectives. This study is focused in five major defect types. They have developed generalized linear models for each defect type to find the significant factors affecting on the proportion of occurrence of defects the pros of implementing the quality tools; review the issues related to the implementation of such tools and finally understand the role of such tools in the framework of TQM. Kairong [10], Detail investigation on quality improvement of a garment factory by applying Pareto Analysis and Cause-Effect Diagram ,the aim ofthe study was to minimize defects that will reduce rework and rejection rate Tanvir, [4]. According to Dengzler [8]. The SPC methods such as check list, Pareto analysis, cause-effect diagram and control chart were used. The frequencies of sewing defects in the operations at the sewing

department are determined by check list. The operations which have highest sewing defect rates and the effects of these operations to the defect rate are examined by using the Pareto analysis. The reasons of the defects are analyzed with the cause-effect diagram for the operation which has the highest sewing defect rate. The rate of defect in the sewing department is examined statistically by control chart whether it's under control or not. Sampling based statistical quality control system is proposed in finishing section to eliminate 100% inspection by sampling based inspection according to Varsha [10], provide an easy introduction of 7 QC tools and to improve the quality level of manufacturing processes by applying it. An application of methodology in an industry which provides a framework to identify quantify and eliminate sources of variation in an operational process, to optimize the operation variables, improve and sustain process performance with well-executed control plans. Mazedul [11], empirical evidence on Six Sigma implementation in service industries in Singapore According to Chakrabarty,[6], Six Sigma case study analysis involving three service organizations of Singapore the organizations are a local hospital, a construction and related engineering service, and a consultancy service. Pantano [6], designed to test the application of a novel Six Sigma deployment program specifically for SMEs. Introduction a new notion, which we call six sigma supply chains to describe and quantify supply chains with sharp and timely deliveries, and develop an innovative approach for designing such networks. Both total productive maintenance (TPM) and Six Sigma are key business process strategies, which are employed by companies to enhance their manufacturing performance. Therefore, will be to develop and implement an integrated Six Sigma Maintenance (SSM) model for manufacturing industry (Andrew, 2008). Tractable results are obtained by using statistical congruent method and concept of Taguchi method. Song(2008) the authors analyze the principles and results of lean production and compare the lean production philosophy with the six sigma quality process and the principles of total quality management (TQM). At the end of the paper, it is discussed how to build the necessary company culture for having success with these principles/management philosophies. Jens(2000) 1550 9 how organizational culture influences the implementation of different practices incorporated in the recent Six Sigma approach as well as those associated with traditional total quality management (TQM). Pukhraj [11],the objective of this research is to investigate the application and benefits of lean six sigma in the recycling industry Using XP with Six Sigma can provide means of analyzing XP data and systematically improve process performance. In orderto prove our point, we map Six Sigma tools to activities involved at each phase of XP and show that Six Sigma technique can be used with XP to measure and improve the performance of XP process. Sajid [4], identifying what criteria are considered for selecting six sigma projects and how six sigma projects are selected in organizations in the UK. Ricardo [1].Application of Six Sigma using DMAIC viz. Define, Measure, Analyze, Improve & Control model for the defect reduction at a manufacturing concern based at Surat, Gujarat, India Tushar, [4] the grounded theory approach and the scant literature available to propose an initial definition and theory of Six Sigma has enabled the company to eliminate a wide range of long standing process variation problems. The importance of a structured process and the importance of data collection, only when working with the facts, rather than on "gut feeling" do the real causes become clear and solutions effective. Six Sigma effective handling of deep rooted, 2006 the fundamentals of Six Sigma and its use in education. Six Sigma is a set of methodologies used by businesses to achieve extremely low failure rates in any process. Varsha, [10], to offer a practice guide for where to apply six sigma process improvement methodology to the corporate real estate function. Six sigma programs are raging through corporations worldwide, with some corporations citing savings in the $US billions resulting from six sigma implementation the fundamental and critical differences between two of

the most powerful philosophies of modern quality management develop an effective implementation model which consists of six steps. The first step is to perform strategic analysis driven by the market and the customer. A software tool that could be used at any stage of lean implementation, including facilities with no existing. Philip [2], six sigma can be implemented in manufacturing SMEs. Moreover, the motivation for adopting Six Sigma by Australian manufacturing SMEs. It was found that a normative isomorphic change mechanism, under institutional theory, is exclusively involved in the adoption of the Six Sigma methodology. This study also discusses various critical success factors and impeding factors involved in the 1551 10 implementation of quality improvement initiatives, in general, as well as of Six Sigma, in particular. Khawaja [12], In this study an emphasis is given on human angle in context with Indian Culture and work environment because experiences how that for implementation of any new initiatives in organizations, the success of implementation depends on soft skills of people of organizations. Thomas [7], provides an overview of success rates, success factors and existing concepts and tools for business strategy implementation.

Chapter-3
Material & Methodology

Material & Methodology

Materials

1) Defect Chart.
2) Women Blouse.
3) Pencil.
4) Sigma Calculator.

Methods

The quality tools which are used in this project are aimed at identifying analyzing and implementing the defects in the sewing line. Though defects are occurred in various departments in a garment factory, but we have concentrated only in the sewing line. Quality is a main issue of a garment factory. So we have to concentrate on defects. Defects can occur for various reasons. Because of this defects rework time and cost increases. This study includes theatrical idea about sewing line layout, various defects, Pareto chart, cause-effect diagram, sigma level defects per million opportunities. For this research we have selected a 100% export oriented woven garments factory named "Talisman Limited". This segment includes understanding about the quality control system and how they perform when defects occur and analysis the various data. Then analyzing the data we have gathered idea about the defects and try to find a solution how to minimize the defects. Last of all we have tried to implement to reduce defect percentage. The methodology steps are given below:

Step 1: Factory Selection

For our research work first we have to select a factory from where we have to collect data. After a lot of searching we have been allowed by a 100% export oriented woven factory which is situated at DEPZ, Savar, Dhaka.

Step 2: Data Collection

After selecting the factory we have selected the sewing department for our project. We have observed the quality control system of the department. We have collected various defects datafor the month of July 2019 to August 2019 with 2 production lines for our project. This data is obtained by QC man by 100% inspection in the end line QC. We also collected the total garments checked in that time.

Step 3: Analysis Data

In this Step, we've to analyze the collected data to know about the defects amount and percentage of defects. We have to calculate the wise total defect data and two months total defects data Men we've to analysis separate production line defects for women blouse.

Step 4: Analysis Data by Pareto Chart & Cause Effect Diagram

In this step, we've to analyze the defect data by Pareto chart to identify the major defects that occurs in 80% area. From the chart we have to find the defect position where the most defects occur. Then we've to analyze major defects by cause effect diagram to identify the causes and sub-causes. Also to identify for which the major defects occur i.e. man, machine, material and method.

Step 5: Analysis Data by Sigma level

In this step, we've to analyze the total defects and the total checked garments by sigma calculator to know the about the defect standardization i.e. the sigma level and defects per million opportunity.

Step 6: Some Suggestions for Implementation

In this step, we've given some suggestion how to minimize the defects that occurred in the sewing lines.

Chapter-4
Data Analysis

Data Analysis

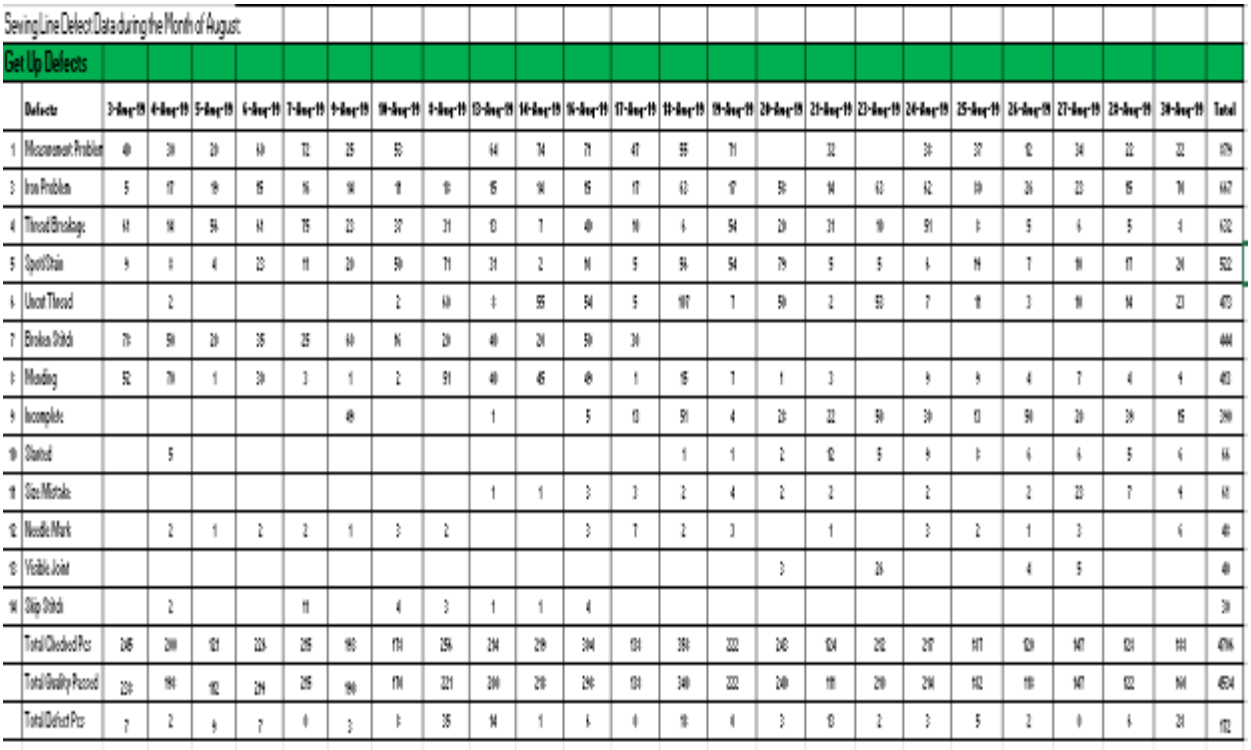
In order to perform our project we have collected three months defects data with 2 production line from the month of July 2019 to August 2019. First of all we show the two months separate defect date and then two months combined defect data. Then we have analysis the data by Pareto Chart and Cause-effect Diagram whose are the tools of Total Quality Management (TQM).Then we have analysis defects by one production line of Women Blouse and identify the major defect area where the most defect percentage are occurred. After that we have analysis defects by Sigma Level to know about the defect standard.

Sewing Line Defect Data during the Month of July:

Sewing Line Defect Data during the Month of July:

Get Up Defects																										
	Defector	1-Jul-19	2-Jul-19	3-Jul-19	4-Jul-19	5-Jul-19	7-Jul-19	8-Jul-19	9-Jul-19	10-Jul-19	11-Jul-19	12-Jul-19	14-Jul-19	15-Jul-19	17-Jul-19	18-Jul-19	19-Jul-19	21-Jul-19	22-Jul-19	23-Jul-19	24-Jul-19	25-Jul-19	28-Jul-19	31-Jul-19	Total
1	Iron Problem	49	48	17	27	21	10	49	13	17	15	41	16	18	19	15	34	19	16	17	22	21	59	56	704
2	Measurement Problem	19	69	34	12	62		59	9	2	2		6	52	6	5	1		1	25	49	10	2	256	641
3	Broken Stitch	9	19	13	12	12	57	29	13	35		36	13	42	94	22	13	3	49				69		553
4	Rou Edge	16	19	15	11	59	6	12	19	12	7	55	11	12	94	12	94	13	2	1	1	59	5	11	497
5	Thread Breakage	15	11	11	61	19	13	12	19	9	69	42	11	57	2	9	91	5	2	4	3	2	1	5	454
6	Incomplete	15	11	19	11	13	4	9	6	19	19	3	25	29	2	5	52	2	2	71	39	49	69	39	438
7	Size Mistake	13	79	11	11	35	12	11	55	6	59	5	59	49	6	2	11	2	2		2	7	3	7	425
8	Skip Stitch			3	3		12	4	4	3	6	6	16	12		3		9	4	4		4	3		96
9	Uncut Thread				6	6						1	11	7	9	11		3	5	4	5	5	4	16	99
10	Shorted	4	11															1	4	6			6		32
11	Needle Mark														4		1	1	3	3	2	1	4		25
12	Visible Joint																							16	16
13	Label Mistake																	9				5			14
14	Others																							6	6
	Total Checked Pcs	122	247	154	147	217	122	217	179	144	216	194	212	253	74	114	219	67	11	135	165	145	191	400	2909
	Total quality passed	191	236	154	141	219	122	217	179	140	197	193	217	249	43	73	242	53	11	132	93	134	114	342	2696
	Total Defective Pcs	4	11	11	6	6	0	0	0	4	11	3	5	7	13	11	7	14	4	3	7	11	12	33	173

Sewing Line Defect Data during the Month of August:



Sewing Line Defect Data during the Month of August:

Get Up Defects

	Defects	3-Aug-19	4-Aug-19	5-Aug-19	6-Aug-19	7-Aug-19	9-Aug-19	10-Aug-19	11-Aug-19	12-Aug-19	13-Aug-19	14-Aug-19	16-Aug-19	17-Aug-19	18-Aug-19	19-Aug-19	20-Aug-19	21-Aug-19	23-Aug-19	24-Aug-19	25-Aug-19	26-Aug-19	27-Aug-19	28-Aug-19	30-Aug-19	Total
1	Measurement Problem	49	38	28	69	72	25	93		64	74	71	47	88	71		32		38	37	92	34	22	32	879
3	Iron Problem	5	17	19	15	16	98	19	19	15	94	15	17	63	97	59	94	63	62	89	26	23	15	79	667
4	Thread Breakage	61	94	94	61	79	23	37	21	13	7	49	19	6	54	29	21	19	91	9	5	6	5	6	632
5	Spot/Stain	9	8	4	23	11	29	59	71	21	2	14	5	54	54	79	5	5	6	19	7	19	17	24	522
6	Uncut Thread		2					2	69	8	55	54	5	107	7	59	2	53	7	19	3	19	14	23	473
7	Broken Stitch	79	59	29	35	35	69	16	29	49	24	59	39												444
8	Moading	52	79	1	29	3	1	2	91	49	45	49	1	95	7	1	3		9	9	4	7	4	9	413
9	Incomplete						49			1		5	13	91	4	29	32	59	39	13	59	29	29	15	390
10	Stained		5											1	1	2	12	5	9	8	6	6	5	6	66
11	Size Mistake									1	1	3	3	2	4	2	2		2		2	23	7	9	61
12	Needle Mark		2	1	2	2	1	3	2			3	7	2	3		1		3	2	1	3		6	40
13	Visible Joint															3		26			4	9			49
14	Skip Stitch		2			11		4	3	1	1	4													38
	Total Checked Pcs	245	269	103	226	295	165	179	254	214	219	244	134	359	322	245	104	215	217	117	109	147	103	111	4316
	Total Quality Passed	229	191	102	219	295	169	179	221	209	210	245	134	340	322	249	111	210	214	112	111	147	102	111	4524
	Total Defect Pcs	7	2	9	7	0	3	0	25	14	1	6	0	19	0	3	13	2	3	5	2	0	6	24	172

Two Months defects Table:

DEFECT NAME	MONTH	
	JULY	AUGUST
Iron Problem	700	667
Spot/Stain	641	522
Measurement Problem	553	879
Broken Stitch	497	444
Raw Edge	456	413
Thread Breakage	438	632
Incomplete	425	390
Size Mistake	96	61
Skip Stitch	90	38
Uncut Thread	32	473

Slanted	25	66
Needle Hole Mark	16	51
Visible Joint	14	44
Others	06	26
TOTAL	**3989**	**4706**

Table: Two months defects data.

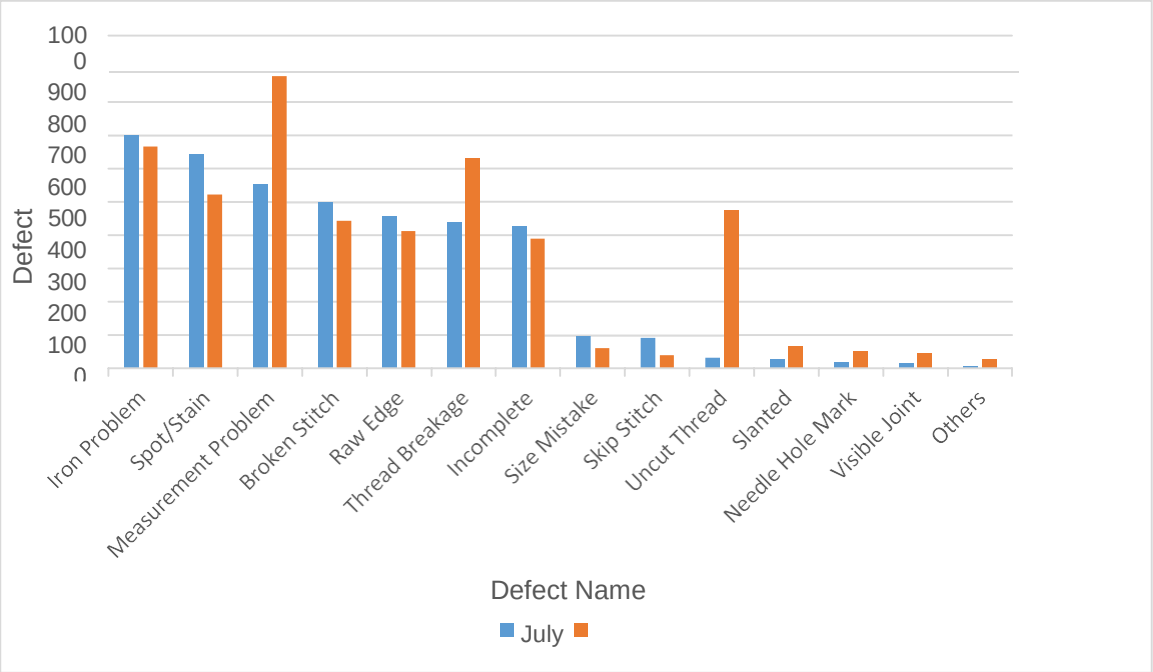


Fig: Two Months Separate Defect by Bar Graph.

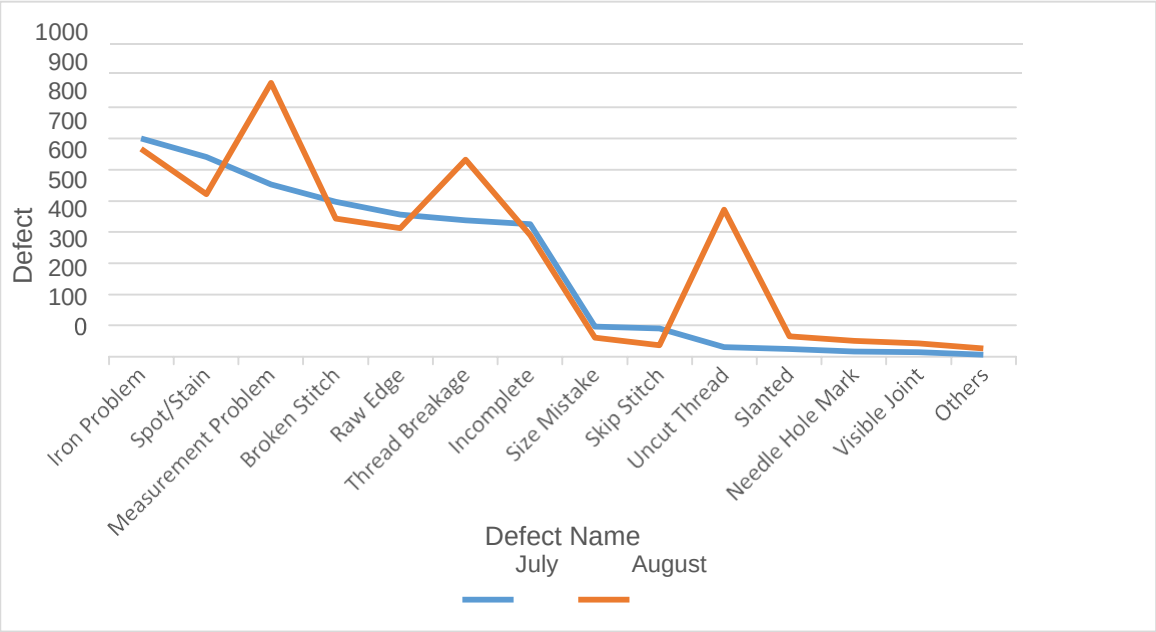


Fig: Two Months Separate Defect by Line Graph.

Two moths combined defects and their cumulative percentage:

DEFECT NAME	TOTAL	CUMULATIVE PERCENTAGE (%)
Measurement Problem	1432	16.46
Iron Problem	1367	32.18
Spot/Stain	1163	45.55
Thread Breakage	1070	57.85
Broken Stitch	941	68.67
Raw Edge	869	78.66
Incomplete	815	88.03
Uncut Thread	505	93.84
Size Mistake	157	95.64
Skip Stitch	128	97.12
Slanted	91	98.17
Needle Hole Mark	67	98.94
Visible Joint	58	99.61
Label Mistake	31	99.98
Total	**8695**	**100%**

Table: Two moths combined defects and their cumulative percentage.

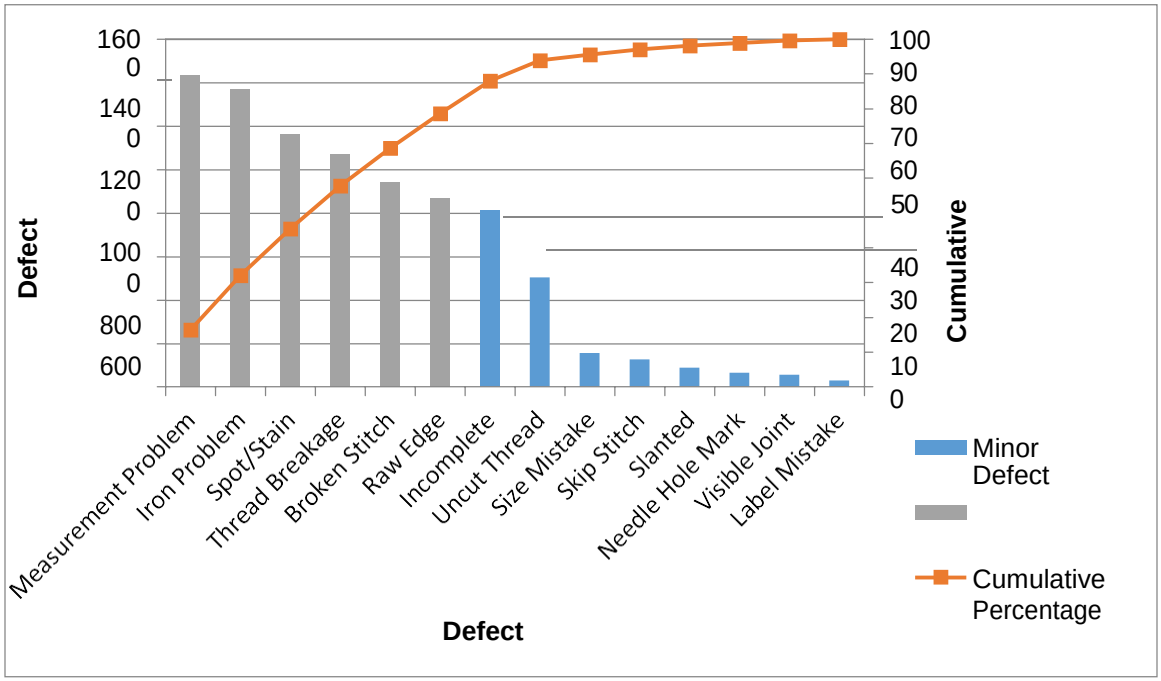


Fig: Two Months Combined Defect by Pareto Chart

Observations from Pareto Analysis for Major Defect Positions:

i. **Measurement Problem** is the most frequent defect with as much as **16.46%** of the total defects.

ii. **Iron Problem** is the second most frequent defect with **15.72%** of the total.

iii. Among other defects contribution of **Spot/Stain** is **13.73%, Thread Breakage** is **12.3%, Broken Stitch** is **10.82%** and **Raw Edge** is **9.99%.**

iv. These six major defect positions are the **"vital few"** where **78.66%** of total defects occur.

Now, we have to analysis defects by line. For that we have been selected one lines. This line is produced the product of Women Blouse. So, we have analysis the defects as combined two months.

Identify and Analysis Defects For Women Blouse:

Two Months Separate Defect Chart for Women Blouse Shirt:

DEFECT NAME	MONTH	
	JULY	AUGUST
Iron Problem	560	487
Spot/Stain	441	422
Measurement Problem	433	411
Broken Stitch	403	400
Raw Edge	389	350
Thread Breakage	338	332
Incomplete	325	256
Size Mistake	79	58
Skip Stitch	80	37
Uncut Thread	22	173
Slanted	20	56
Needle Mark	11	41
Visible Joint	10	34
Label Mistake	06	16
TOTAL	**3117**	**3073**

Table: Two Months Separate Defect Chart for Women Blouse.

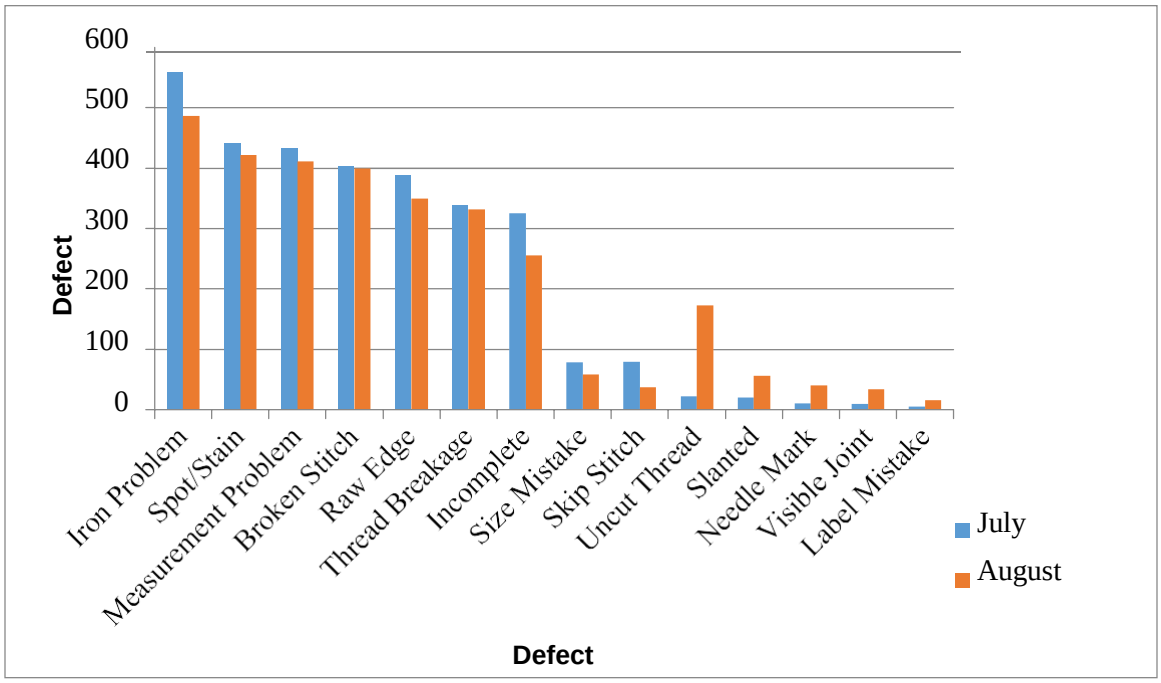


Fig: Two Months Separate Defect by Bar Graph for Women Blouse.

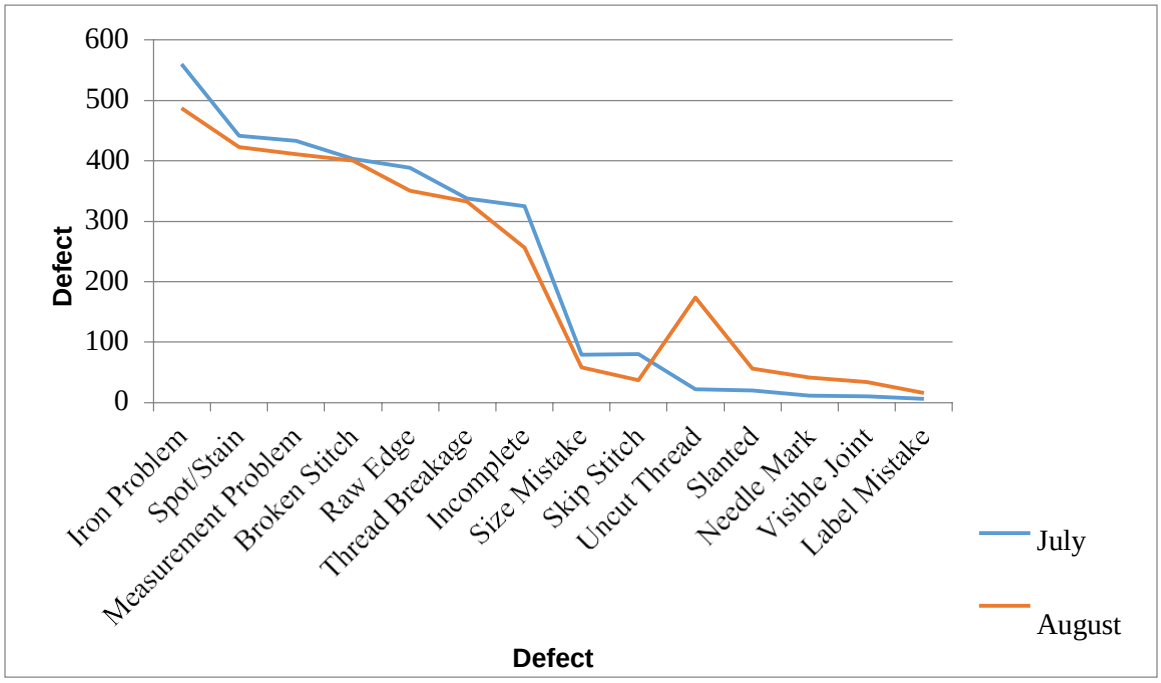


Fig: Two Months Separate Defect by Line Graph for Women Blouse.

Two Months Combined Defect Chart for Women Blouse:

Defect Name	Combined Defect Amount	Cumulative Percentage (%)
Iron Problem	1047	16.91
Spot/Stain	863	30.85
Measurement Problem	844	44.48
Broken Stitch	803	57.45
Raw Edge	739	69.39
Thread Breakage	670	80.21
Incomplete	581	89.60
Uncut Thread	195	92.75
Size Mistake	137	94.96
Skip Stitch	117	96.85
Slanted	76	98.08
Needle Mark	52	98.92
Visible Joint	44	99.63
Label Mistake	22	99.98
TOTAL	**6190**	**100%**

Table: Two Months Combined Defect Chart for Women Blouse.

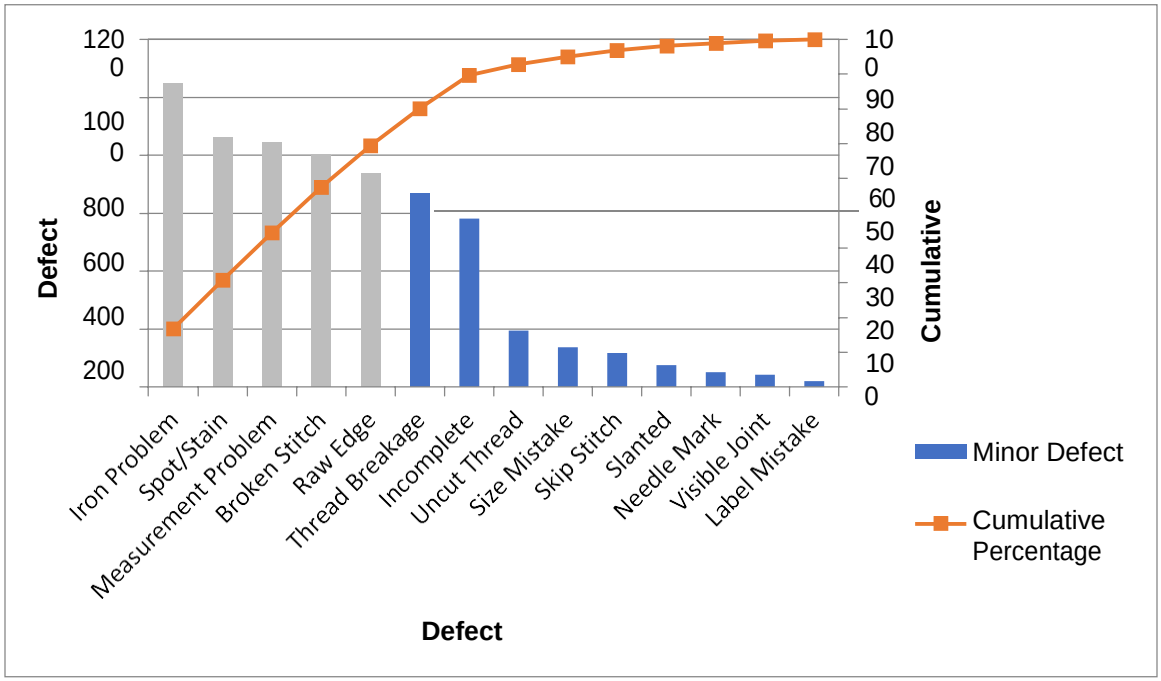


Fig: Two Months Combined Defect Analysis by Pareto Chart for Women Blouse.

Observation from the Analysis:

I. **Iron Problem** is the most frequent defect with as much as **16.91%** of the total defects of Women Blouse.

II. **Spot/Stain** is the second most frequent defect with **13.94%** of the total.

III. Among other defects contribution of **Measurement Problem** is **13.63%, Broken Stitch** is **12.97%** and **Raw Edge** is **11.94%.**

IV. These five major defect positions are the **"vital few"** where **69.39%** of total defects occur.

Major Defects Analysis by Cause-effect Diagram:

From the Pareto Analysis we find five major defects. These are-

1) Iron Problem
2) Spot/Stain
3) Measurement Problem
4) Broken Stitch
5) Raw Edge

Defects can be occurred by four ways.

I. Man,
II. Machine,
III. Material,
IV. Method.

The cause-effect diagram show in which process the defects occurred. These five defects are shown by cause-effect diagram below:

Cause-effect Diagram for Iron Problem:

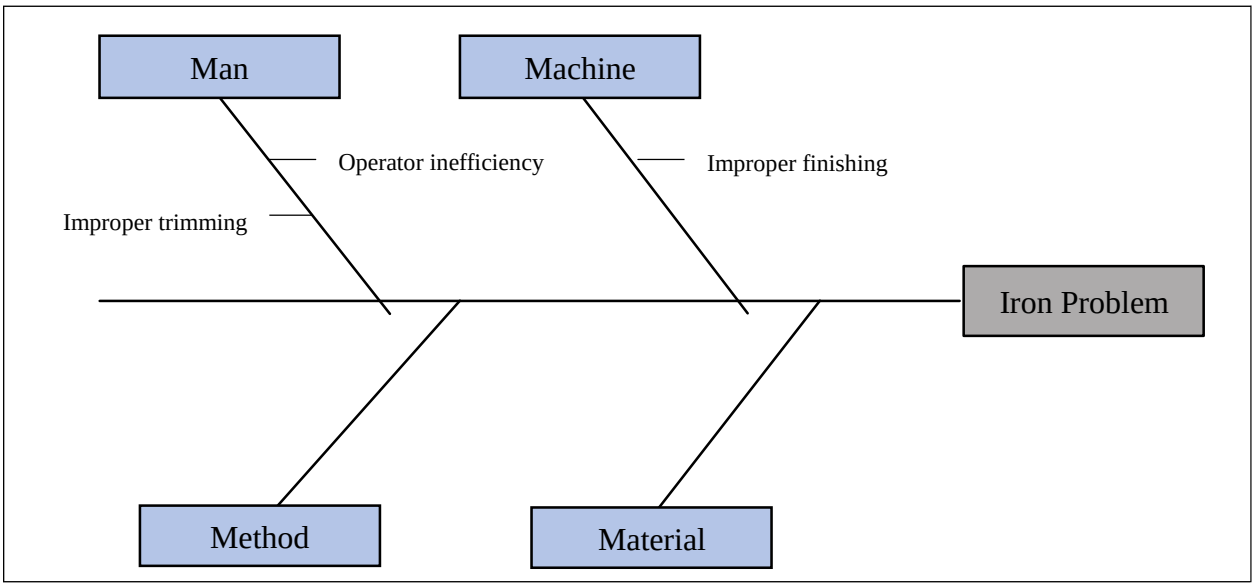


Fig: Cause-effect Diagram for Iron Problem.

Cause-effect Diagram for Spot/Stain:

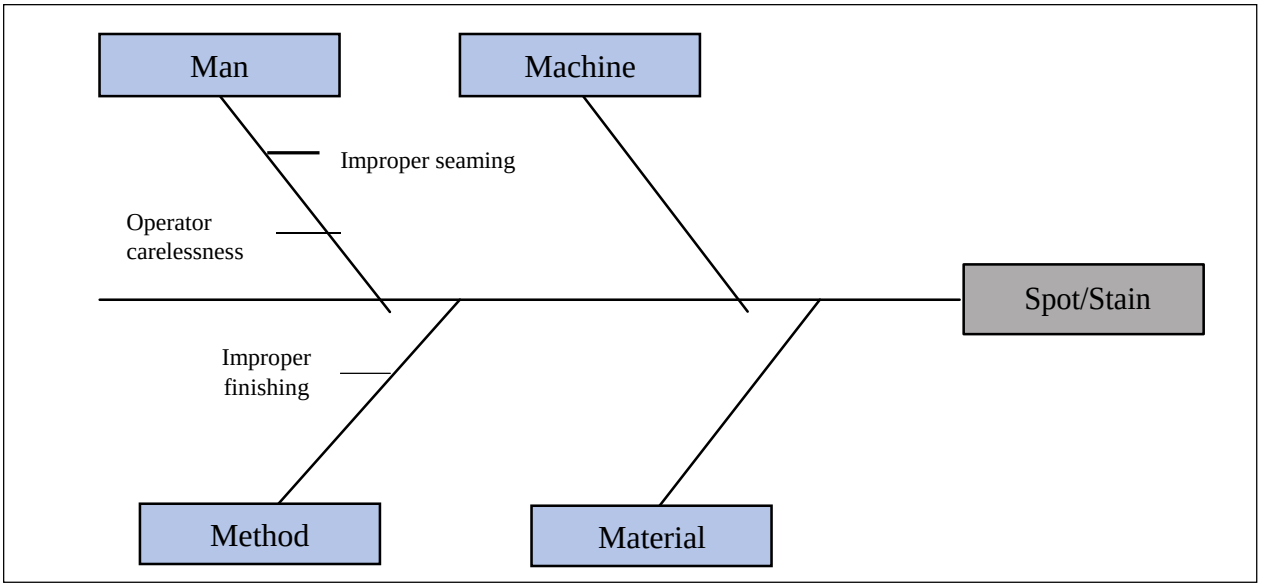


Fig: Cause-effect Diagram for Spot/Stain.

Cause-effect Diagram for Measurement Problem:

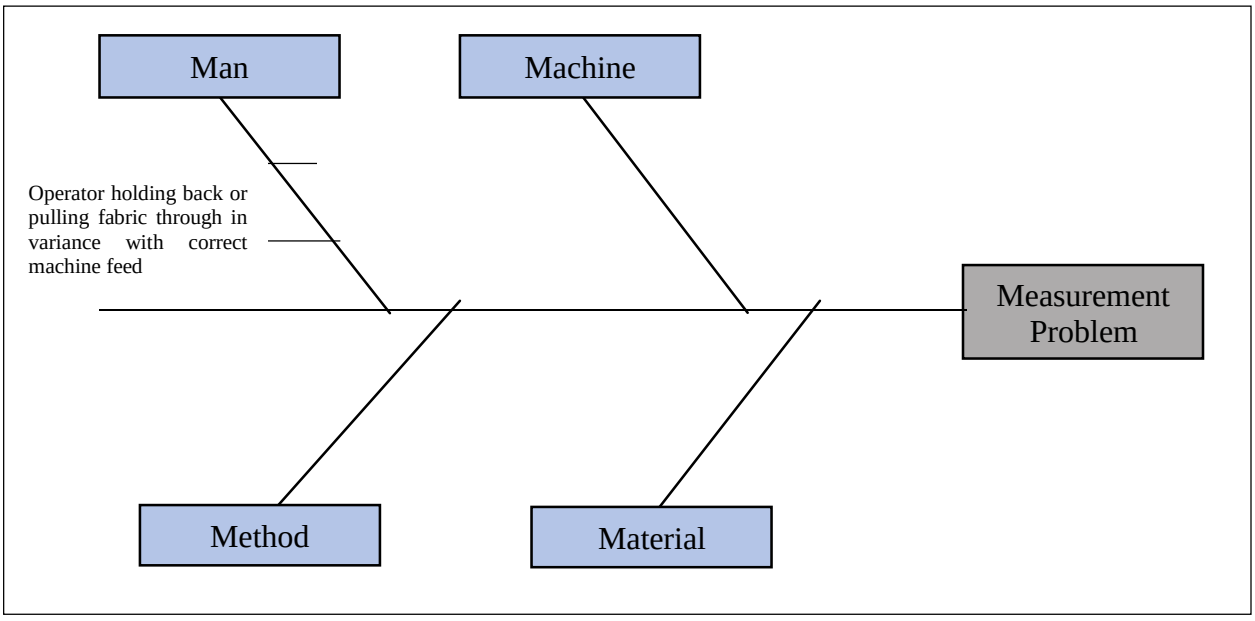


Fig: Cause-effect Diagram for Measurement Problem.

Cause-effect Diagram for Broken Stitch:

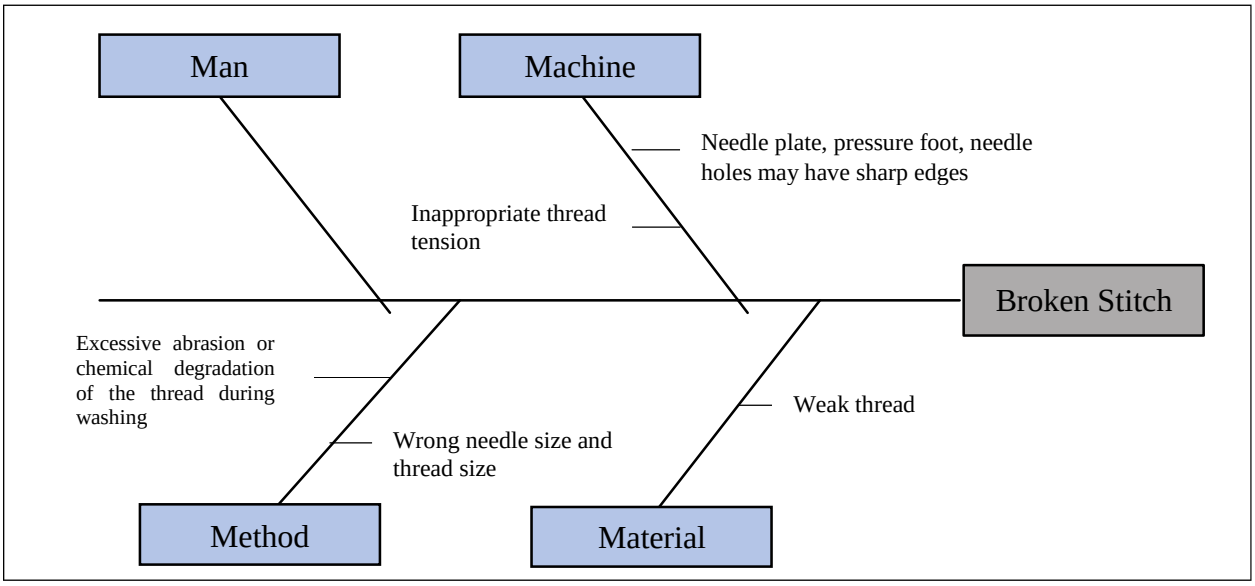


Fig: Cause-effect Diagram for Broken Stitch.

Cause-effect Diagram for Raw Edge

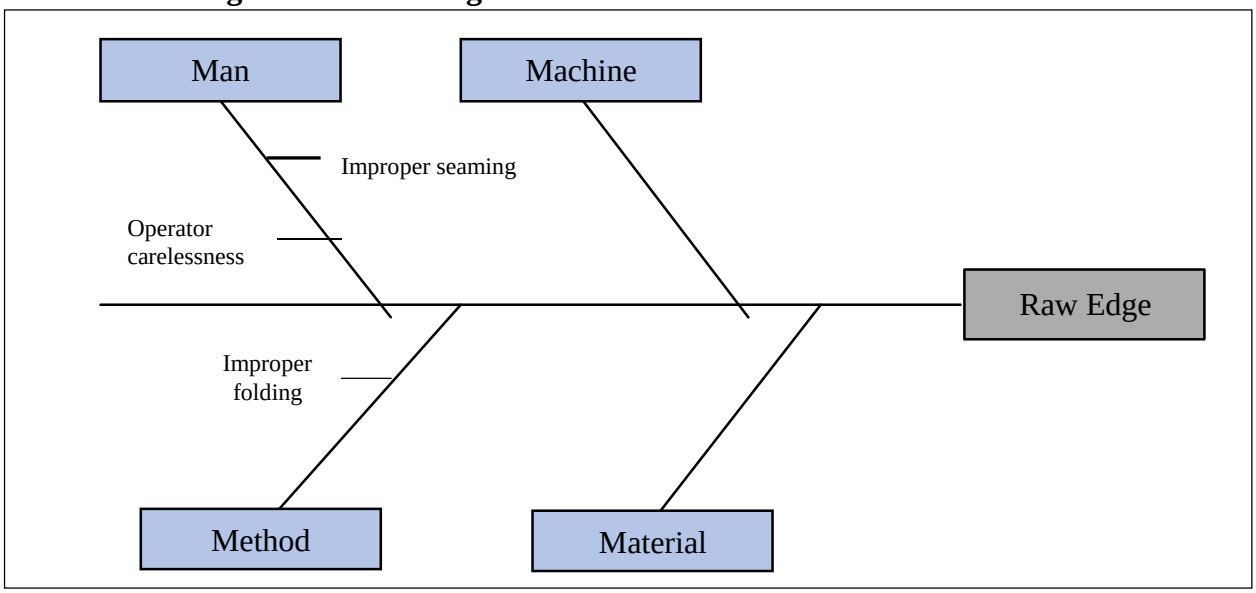


Fig: Cause-effect Diagram for Raw Edge

Suggestions to Reduce Major Defects Percentage

Suggested Solutions for Iron Problem:

Cause Types	Causes	Suggested Solutions
Man	Operator inefficiency	Provide adequate training to the operators
	Improper trimming	Provide thread cutter to every operator and make used to.
Machine	Improper finishing	To cut thread properly, start regularly checking system to check the auto trimming machine is properly functioning or not.
		Improve quality inspection system.

Suggested Solutions for Spot/Stain:

Cause Types	Causes	Suggested Solutions
Man	Improper seaming	Give proper training to the operators.
	Operator carelessness	Improve supervision.
Method	Improper finishing	Improve or change finishing system.

Suggested Solutions for Broken Stitch:

Cause Types	Causes	Suggested Solutions
Machine	Inappropriate thread tension	Tension of the thread properly adjusted.
	Needle plate, pressure foot, needle holes may have sharp edges	Inspect the needle point at regular intervals and check for sharp or burred points.
		Sharp edges should be removed.
Material	Weak thread	Select good quality thread which is free from flaws.
Method	Wrong needle size and thread size	Needle size and thread size should be synchronized.
	Excessive abrasion or chemical degradation of the thread during washing	Special care should be taken during washing.

Suggested Solutions for Measurement Problem:

Cause Types	Causes	Suggested Solutions
Man	Unskilled Measuring person	Using automatic measuring tools.
	Operator holding back or pulling fabric through in variance with correct machine feed	Improve the skill of operator.
		Never pull on the fabric while cutting.

Suggested Solutions for Raw Edge:

Cause Types	Causes	Suggested Solutions
Man	Improper seaming	Give proper training to the operators.
	Operator carelessness	Improve supervision.
Method	Improper folding	Improve or change folding system.

DPMO and Sigma Level Analysis

The main reason of this analysis is to know about defect standard level according to Sigma chart. For this analysis, we have used sigma software calculator. If we give input the total garments checked amount, no. of defects amount, opportunity/unit and standard sigma shift then we find the defects percentage (%), defects per million opportunities (DPMO) and sigma level.

If Sigma Level increases, then Defect Percentage decreases i.e. number of defects decrease.
Now Analysis by Sigma Calculator:

For the Month of July Data:

Total Garments Checked	3989
No. of Defects	173
Defects Per Opportunity (DPO)	0.0433
Defects Percentage (%)	4.34
Defects Per Million Opportunities (DPMO)	43369
Sigma Level	3.3

For the Month of August Data:

Total Garments Checked	4655
No. of Defects	172
Defects Per Opportunity (DPO)	0.0369
Defects Percentage (%)	3.70
Defects Per Million Opportunities (DPMO)	36950
Sigma Level	3.3

For Two Months Combined Data:

Total Garments Checked	8695
No. of Defects	345
Defects Per Opportunity (DPO)	0.0396
Defects Percentage (%)	3.97
Defects Per Million Opportunities (DPMO)	39678
Sigma Level	3.3

For Women Blouse Data of Two Months Combined:

Total Garments Checked	6190
No. of Defects	240
Defects Per Opportunity (DPO)	0.0387
Defects Percentage (%)	3.88
Defects Per Million Opportunities (DPMO)	38772
Sigma Level	3.3

Two Months Combined Bar-line Graph for Full Production Lines, Women Blouse:

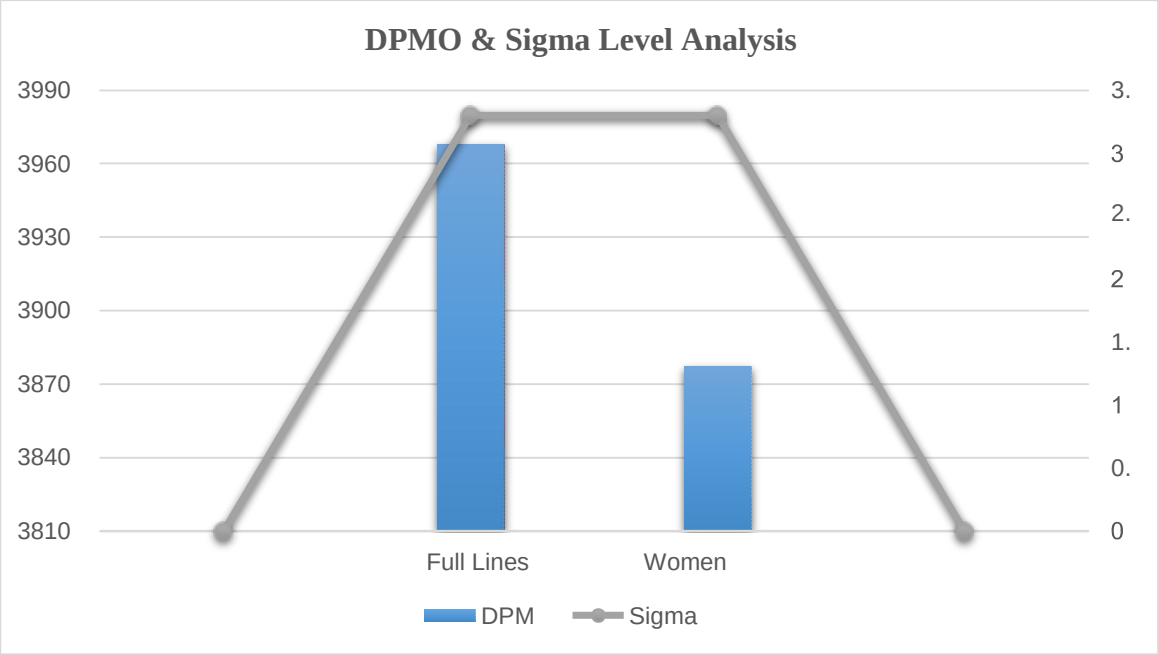


Fig: DPMO & Sigma Level Analysis.

Observation

From the analysis, we find that defects level lies between the 3 to 4 sigma levels. So Defect Standard of this factory is medium quality. Here Sigma Level of full Production Lines is 3.3, Women blouse Production Line is 3.3.

Results

Results for Pareto Chart Analysis:

From the two months combined defect chart with full production line we find 6 major defects which contains 78.66% of total defects. From the Women Blouse Production line we find 5 major defects which contain 69.39% defect.

For Sigma Level Analysis:

For full production line, we find sigma level 3.3. For Women Blouse Production line, we find sigma level 3.3.

Conclusion

Quality is a serious issue for an export oriented garment‟s factory. In order to take a strong position in the global completion, it is necessary to keep 100% quality on the product. Now a- days, buyers are more concern on quality. If any fault is found, they will have to cancel the full order. So, it is a great responsibility for a quality department in a garment factory. In this view, we are tried to analysis the quality condition in the "Talisman Limited". Garments factory has many departments, so a short time we are not able to observe the all departments. So, we concentrate on sewing department only. Here we have studied on the defects and tried to find out the major defects with their concerned area. We have used Pareto chart to find out the major defects by 80/20 rules. From this analysis, we find 6 common major defects which are occurred in all the production lines. After that we have used sigma calculator to find out DPMO and Sigma level. From this we have easily understood the defect conditions of the sewing lines of this factory. Then we have used thecause-effect diagram to find out the causes and sub-causes which are responsible for major defects. But it is our great lacking that we are not able to implement anything in the sewing line because of production load. But we have suggested some suggestions to the QC manager. If our suggestions are applied on the lines, we hopeful that the defect percentage, rework cost and time will decrease and the productivity will increase.

Chapter-5

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