STUDY ON QUALITY CONTROL IN KNIT GARMENTS PRODUCTION

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Textile Engineering

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DECLARATION

I hereby declare that, this project has been done by me under the supervision of **Engr. Md. Mahfuzur Rahman, Senior Lecturer, Department of TE** Daffodil International University. I also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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ABSTRACT

This project is on “Study on Quality Control in Knit Garments Production”. Garment manufacturing is quite different from any other conventional manufacturing. It is not a continuous production method. Each style is different product that requires different type of fabric, color, buttons, thread, etc. Hence requirement of product integrity at every stage requires detailed knowledge about the quality parameters, quality problems, their causes and remedies. For quality production it is better to know the complete process of garment making (selection of yarn-fabric production and garment manufacturing) so that quality level can be improved. In garments industry quality means, Garments are free from stain, fabric faults, sewing faults, button or button holes faults, size or measurements faults, washing shrinkage & handle faults. Quality may be defined as the level of acceptance of a goods or services. For the textile and apparel industry, product quality is calculated in terms of quality and standard of fibers, yarns, fabric construction, color fastness, designs and the final finished garments. Different garments factory follow different quality control and management systems especially different inspection systems for garment inspection (i.e. 4-point system, 10-point system,AQL etc.). Nowadays buyers are very much quality conscious. If it is possible to maintain a high Quality system of inspection policy, the buyers shall be motivated and more quality products can be made. So, it is possible to set different modern quality procedures and quality management techniques for the betterment of RMG sector. This project also has been tried to represent the modern techniques of quality control in knit garments industries.

TABLE OF CONTENTS

LIST OF FIGURE

CHAPTER-I

INTRODUCTION

1.1. Introduction:

Industrial project is the first step to professional life of student, especially of technical Side. It's an indispensable part of study a practically running processing technology of an industrial unit for a student .In our university , processing machines are not in continuous running condition, so it would only provide demonstration of mechanical features & processing technology of the material in accomplishment of the theory there of but not of the situational variables to achieve practical knowledge. Quality has been with us since the dawn of civilization, however, a competitive weapon or competitive advantage. In order to understand this we have only to look at Japan which is textbook case of how a nation used quality to become a world player in trade the industry. Some of the other countries such as South Korea, Taiwan, and Singapore in Asia / Pacific follow this model and became very successful in the world arena. Customers all over the world have become so demanding and expecting good quality that increasingly, quality is no longer a competitive advantage, but it is becoming a sheer necessity to survive in the marketplace. Therefore, quality has to be designed and built into products and not just "inspected" into products [1].

The costs represented by this effort can be a significant proportion of the products sales value (Do you know what the total is in your Company? In some instances the cost of scrap, rework and inspection costs alone has been found to be as high as 20% of turn-over) and any manufacturer should be interested in making sure that he is getting good value for his expenditure. He cannot feel sure unless he has studied what the costs are, how they are incurred and what they ought to be. If they are higher than they should be, he must consider ways in which they can be reduced. Here we describe the nature of

the costs incurred in ring product quality and reliability and shows how costs can be reduced whilst quality and reliability are maintained or improved [2].

CHAPTER-II

QUALITY & QUALITY CONTROL

2.1. Quality:

Each & every product features some special characteristics for which it is in demand by consumers. History of quality is as old as human civilization itself. Aristotle 2500 years ago defined quality as following:

1. Quality is the difference between products.
2. It is the goodness or badness in a product. This definition holds true till this date. However, in general terms, quality encompasses important characteristics of a product for which, it is in demand. Quality is also referred to as "conformance of goods to buyers' specifications". ISO 9000: 2000 defines quality as "degree to which a set of inherent characteristics fulfill requirements".

2.2. Quality depends on:

Quality depends on two things. Such as given below:

Form: It represents features of a product in terms of shape, size, style, design & measurements.

Content: It represents features expressing internal quality, implying quality of raw materials & the value additions attached to it.

2.3. Importance of quality:

Every product must feature functional characteristics as well as some other aspects related to its shape, size & design. Consumers always demand following expectations of the purchased product:

The product must satisfy the consumer in terms of beauty, attractiveness, taste, shape, design & longevity etc. depending on the type of product.

A product devoid of quality has no demand among consumers & as such, has no salability. Excellent quality characteristics enhances salability of the goods & are the keys to profitability for the manufacturer or the seller. Most importantly, some criteria of customer satisfaction are negotiable but quality is such a factor that it is not at all burgainalbe.

2.4. Types of Quality:

As per excellence of satisfaction, quality may be grouped into three categories:

1. Quality of general acceptance;
2. Quality of satisfaction;
3. Quality category of higher delight.

A black & white television now-a-days brings in only quality of general acceptance while a color television provides to the buyer quality of satisfaction. On the other hand color television with a remote control brings forth quality of great delight to buyer.

2.5. Quality characteristics in an apparel [3]:

Fig. 1.1: Quality Control in Garments Industry

In a clothing factory, manufactured garments must possess specified quality characteristics. They are giver below: 1. Measurements specified by the buyers;

2. Specified sewing & stitching quality
3. Raw materials must possess specified quality
4. Garments must possess specified design characteristics.
5. Assortment specified by the buyer
6. Finishing, packing, packaging must be specified by the customers.

So, quality of garments implies whether the specified garment has been produced with specified raw materials, with buyer specified stitching & sewing quality, with specified sizes, shapes, design & assortment.

In clothing industry, demanded quality characteristics of the garments are informed to the manufacturer through work sheet, approved sample & size spec etc.

1.6. Quality Control:

Quality control is the operational techniques and activities that are used to fulfill requirements for quality. On the other words, a system applied to manufacturing operations to monitor & regulate production process continually so that products meet specification.

1.7. To control the quality of garments or products two techniques are followed, such as[4]:

- Testing and
- Inspection

2.7.1. Testing:

To those engaged in the production, distribution and consumption of textiles, testing can be a valuable aid provided tests are made the results must be studied carefully so that the right course of action may be taken. Testing instruments cannot make decisions and in the end some person has to interpret the data and issue the necessary instructions for future action.

2.7.2. Inspection:

The inspections are done to control the quality is means by examining the products without any instrument. To examine the fabric, sewing, button, thread, zipper, garments measurement and so on according to specification or desired standard is called inspection. There are so many facilities for inspection in every section of garments industries. The aim of inspections is to reduce the time and cost by identifying the faults or defects in every step of garments making.

2.8. Quality Assurance:

Fig. 2.1: Quality Assurance

To carry out all those planned and systematic actions necessary to provide adequate confidence that a product or service will satisfy given requirements for quality is called Quality assurance. On the words, this is a system to assure that product & services meet customer requirements.

CHAPTER-III

QUALITY MANAGEMENT SYSTEM

3.1. Quality Management System [5]:

Fig. 3.1: Quality Management System

Quality Management System (QMS) is a set of interrelated techniques, measures and management system designed to prevent defects from occurring or if they occur at all. Countermeasures are adopted immediately so that they do not recur. QMS takes recourse to preventive as well as remedial measures.

3.2. Quality Management System in the garments industry:

A number of systems, measures & techniques are used so that only quality goods are produced in the first place and defects do not originate at all. If they occur at all, there must be corrective action so that they are eliminated in the preliminary stage and would not reappear. QMS generally employs the following measures, techniques the ensure that only quality good are produced:

* Inspect all incoming, in-process & final goods to ensure quality of goods.
* Ensure that all patterns & grading of patterns are okay.
* Inspect marker and check if it is okay and within consumption.
* Inspect spreading, cutting & numbering.
* Ensure if relaxation time was given to knit fabric.
* Install in-line inspector in the sewing lines.
* Install Traffic Light Chart system or other system to monitor quality in production line.
* Inspect 100% goods delivered from sewing lines.
* Inspect the table quality passed garments with Statistical Technique.
* Control reject goods so that they do not mixup with quality passed goods.
* Control repairable goods, washable goods so that they can be double checked to ensure quality.
* Inspect goods with right equipment's and in right conditions.
* Inspect ironing, folding.
* Make repeat inspection of garments prior to poly-bagging.
* Inspect poly-bagging & assortment.
* Final table inspection in conducted prior to shipment of goods.
* Impart training QA personnel so that they can easily identify defects & understand the causes of defects.
* Impart training QA personnel on Statistical Methods.
* Make continuous improvement plans & implement them.

1.3. Total quality management:

This is one of the latest concepts of management that can ensure the highest standard of quality and productivity ensuring good for all of the workers, management and society. In this system, quality of management and actions are ensured by assuring quality at all stages from vision, planning, purchase, store, cutting, sewing, inspection, packing, administration, welfare, personnel motivation etc. TQM envisages high work standard, work-environment, managerial standard, motivation etc. Thus comes the concept of production system with minimal or "zero de-fact".

1.4. Job description of Quality Manager :

The quality manager is a very important official in a garment factory. Customer satisfaction, reputation of the company, to a large extent, depends upon him. His job description is given below**:**

1. He will install or maintain a right Quality Management System to ensure quality of product;
2. He will ensure that the QMS is in place & working as envisaged;
3. He will ensure that the existing QMS satisfies the buyer;
4. He will look for ways of improving existing QMS so as to exceed expectations of the customer;
5. He will ensure that buyer's specifications are properly understood;
6. If there is any ambiguity/ confusion, he will confirm buyer's actual Specifications;
7. He will ensure that AQL of the company is properly maintained & exceeded.
8. He will ensure that all incoming, in-process & final goods are properly inspected & documented.
9. He will ensure that all goods coming in the store are rigorously inspected for quality & quantity;
10. He will ensure that Traffic Light Chart system of in-line inspection system is installed & working;

11. He will install both preventive & remedial measures against occurrence of any defect;
12. He is responsible for failure of quality passed garment;
13. He will ensure that all of his personnel are trained on their topics;
14. He will ensure continuous training of personal to enhance their skill;
15. He will ensure rigorous control of rejects;
16. He will ensure rigorous control of repairable & washable garments;
17. He will plan for year-wise improvement of quality;
18. He will prepare a quality manual for the company so that company's quality policy & procedures are known to all and implemented at all levels;
19. He will ensure that quality manual includes all policy, procedures, methods & measures so as to unify actions;
20. He will monitor performance of suppliers of raw-materials;
21. He will have his personnel motivated.
22. He will ensure that supplier-customer chain in maintained in the production process;
23. He will ensure that production commences only when worksheet approved sample & swatch card are at hand.

ISO:

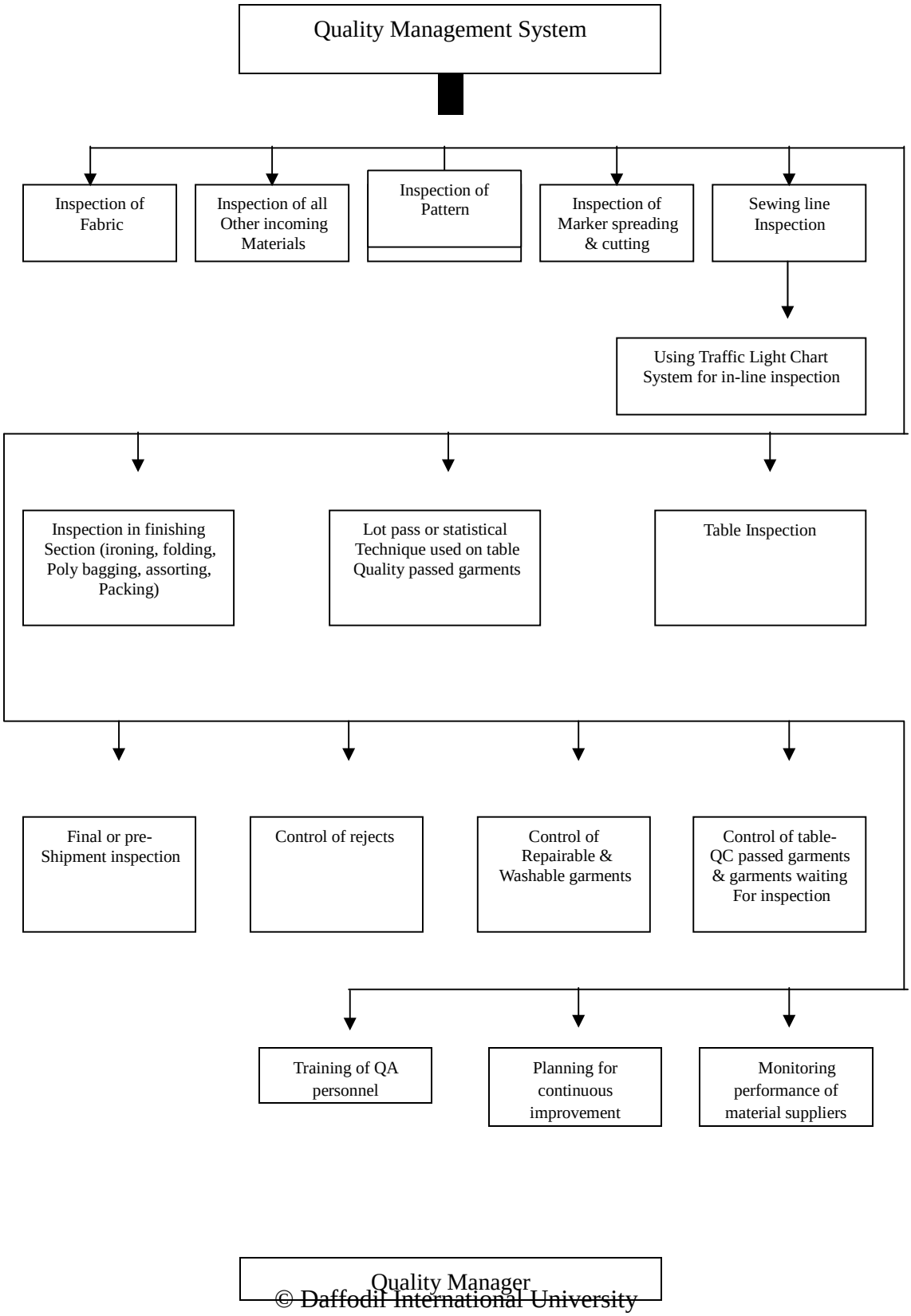
According to ISO,

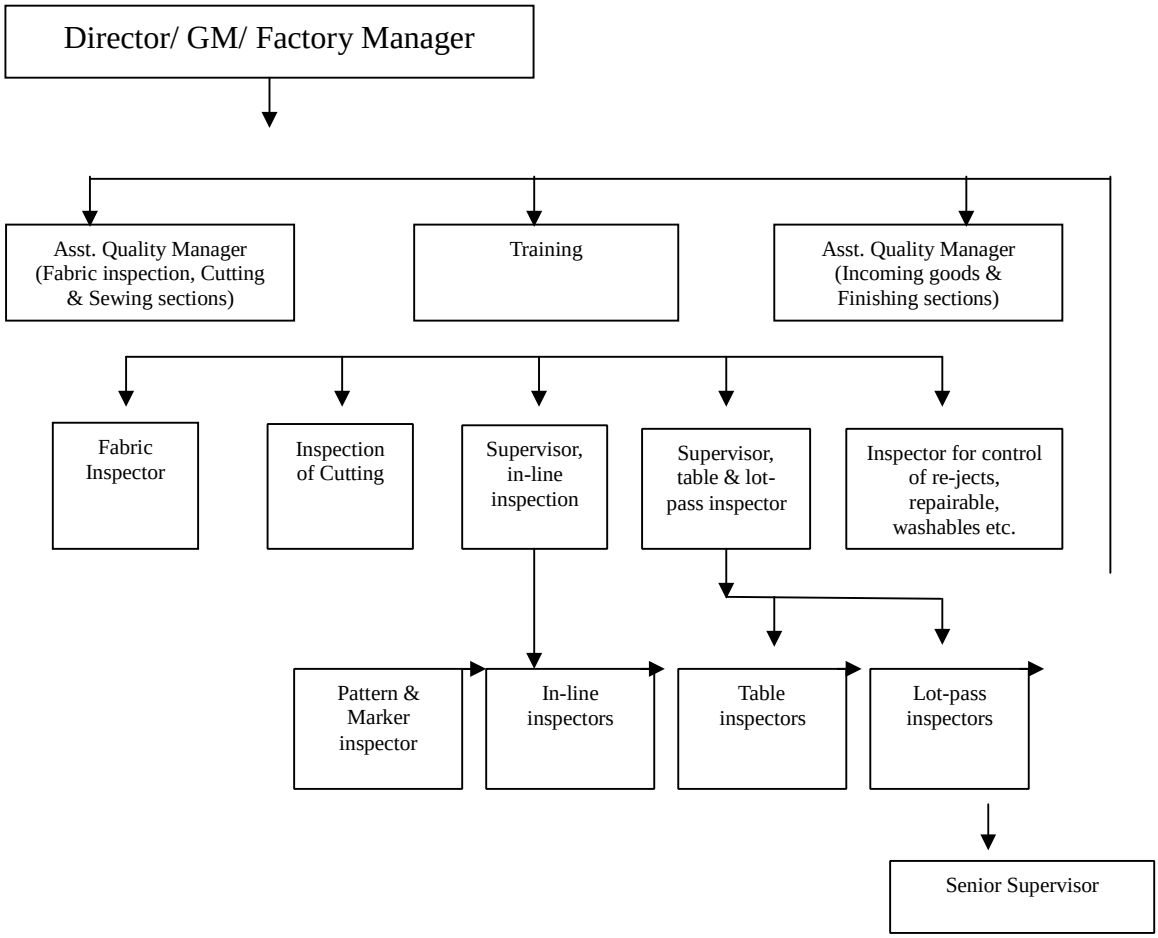
Quality is the fulfillment of specified requirements of the product or service' another definition of ISO,

The totality of features & characteristics of product or service that bear on its ability to satisfy stated or implied needs. The term usually combined with a number or name used to identify textile products. A relative term used to indicate the perceived merits of similar products for same end use.

* Quality varies from customer to customer.
* Quality is the reflection of customers.

1.5. Oregano gram of Quality Management System in the garment Industry [6]:





CHAPTER-IV

INSPECTION

4.1. Inspection [8]:

Fig 4.1: Quality Inspection

The inspections are done to control the quality is means by examining the products without any instrument. To examine the fabric, sewing, button, thread, zipper, garments measurement and so on according to specification or desired standard is called inspection. There are so many facilities for inspection in every section of garments industries. The aim of inspections is to reduce the time and cost by identifying the faults or defects in every step of garments making.

To do success in inspection, the process can be run by maintaining following "inspection loop".

a. Inspection
b. Identify the defects or faults
c. Knock the appropriate person
d. Identify the reasons of defects or faults
e. Remove the defects or faults.

Mainly inspections are done in three steps in garments industries. The steps are:

1. Raw material inspection
2. In process inspection
3. Final inspection.

For inspection to be effective the entire inspection loop as shown in fig.6.2 must be completed.

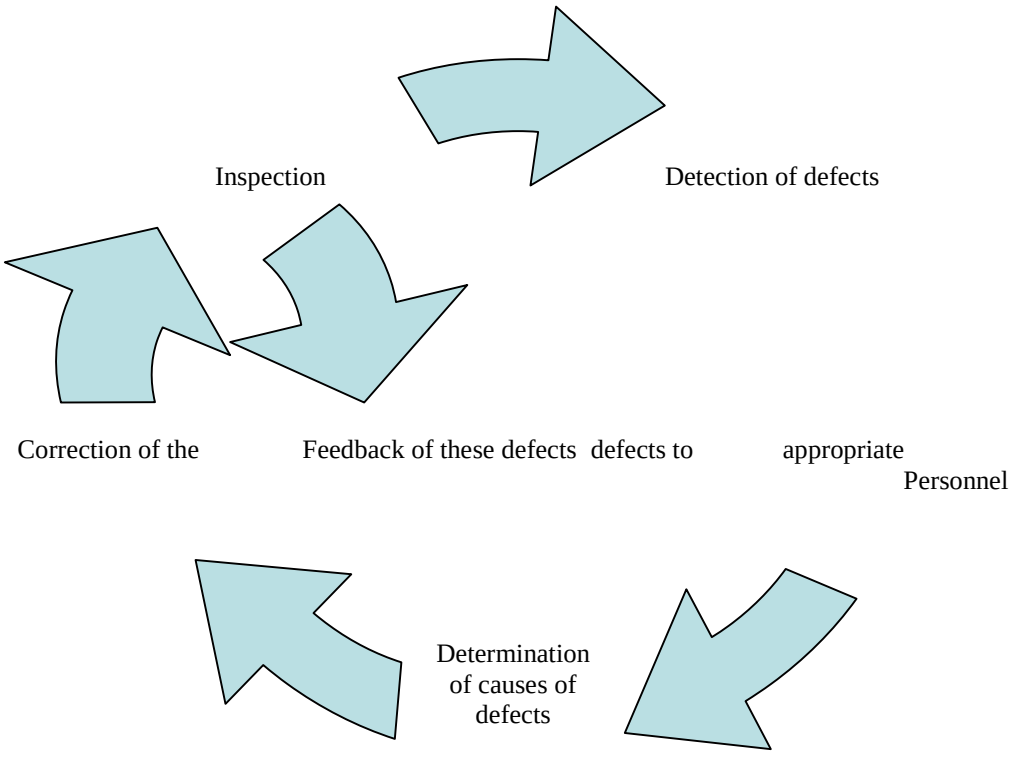


Fig. 5.1: Inspection Loop

1.2. TRAFFIC LIGHT CHART SYSTEM OF IN-LINE INSPECTION [9]:

This is a dependable modern system of in-line process inspection that can demonstrate line quality visually. This system allows identifying defect at the earliest stage of production and thus can offset increasing defect beyond limit. In this system, every operator is provided with a traffic light chart in front of her, In-line inspector checks the lot or bundle completed by the operator. This results in early identification of defects, as less rejects are produced in this method, so the company profits from this system. The operators also are benefited because they have to rework less and can produce more.

1.3. Composition of the chart:

Such a chart comprises four portions:

1. First portion displays main aspects of inspection of concerned operation; 2. 2nd-portion displays result of inspection through red, yellow & green color system;

3. 3rd portion shows fault code.
4. 4th portion gives analysis of defect & remark (fault analysis & remark)

4.4. Usefulness of traffic light chart:

Traffic Light Chart is so installed in front of an operator that it is displayed to the all concerned. So the operator, supervisor, floor-in-charge, quality controllers are aware of the level of the quality of operations in the floor. This chart enables analysis fault,

identifies measures to rectify them. By using traffic light chart the following analysis are generated.

1. Weekly Defect Levels:

This report shows number of inspection & defects per line per day, % of defects, etc.

2. Weekly Defect Rates:

This report shows weekly number of defects & rate of defects enabling analyses the situation & thus eliminate causes of defects.

3. 7-Square Red Report

If 7 consecutive squares show red color in this report, this implies that there is serious problem related with quality. So the situation should be brought to the notice of higher authority. This report contains type of operation & defect, workmanship of operator, time of occurrence of defect, etc.

4. Daily Highest 3 defects Report:

This report is produced in consultation with shell & lining inspection report as well as Team repair level sheet. This report is submitted to higher management. Highest defect-operations are kept under 100% surveillance until they are eliminated.

5. Team Repair Level Sheet:

All the defects occurring in an operation are displayed in traffic light chart. Line inspector puts up all the defects occurring on a certain day in team repair level sheet.

This report shows quality situation of a line.

6. Check List:

In order to conduct in-line inspection of shell, lining & final inspection, a clear check list is prepared so that line inspector can work with clear idea.

4.5. Inspection System [10]:

There are various fabric inspection systems as listed below. However we will discuss only the 4-point system because it is used most widely.

1. 4- Point system
2. 10- Point system
3. Graniteville '78' system
4. Dallas system
5. Textile distributors Institute (National Federation of Textiles-1955) system
6. 4- Point system- Revised.

1.6. 4- Point System[11]:

The 4- Point system also called the American Apparel Manufacturers Association (AAMA). In this method, defected points are found out in 100 square. Yds. Of fabric must be rejected if the defected points are greater than 40.

Defects length for warp way and weft way	Points
Up to 3"	1
3" ~ 6"	2
6" ~ 9"	3
Above 9"	4

Defects area for holes and openings	Points
1" or less that 1"	2
Above 1"	4

Note: It must be remembered that, defected point must not be more than 4 in each yard.

For example: for 100 square. Yds. inspection [7].

Defects length	No of faults	No of points
Up to 3”	10	10 X 1 = 10
3” ~ 6”	5	5 X 2 = 10
6” ~ 9”	2	2 X 3 = 6
Above 9”	0	0 X 4 = 4
		Total = 26

1.7. AQL (Acceptable Quality Level)[12]:

The AQL is the maximum percent defective that for the purpose of sampling inspection can be considered satisfactory as a process average. When a customer designates some specific value of AQL for a certain defect or group of defects he indicates to the supplier that his (the customer’s) acceptance sampling plan will accept the great majority of the lots or batches that the supplier submits, provided the process average level of percent defective in these lots or batches is no greater that the designated value of AQL. Thus, the AQL is a designated value of per cent defective that the customer indicates will be accepted most of the time by the acceptance sampling procedures to be used.
The AQL is generally expressed in per cent (%). The AQLs most widely used in apparel industry are 2.5, 4.0, 6.5, and 10.0 depending on the price and item. For example, for low price items and children’s wear AQLs of 6.5 and 10.0 may be quite appropriate, however, for higher price items AQLs of 2.5 and 4.0 may be appropriate.

1.8. Fabric defects defined:

-Baggy:

A fabric which will not lie flat on the cutting table.

-Bar:

Filling wise band across the full width characterized by a change in appearance from normal color or texture of finish. **-Barre:**

An unintentional, repetitive visual pattern of continuous bars and stripes usually parallel to the filling of woven fabric or to the courses of circular knit fabric. **-Balk:**

An incomplete color pattern in a striped or plaid fabric.
Bias filling: The filling yarns or the color pattern not being at right angle to the warp yarns.

-Bowed filling:

The filling yarns or the color pattern having a curvature from the imaginary line drawn straight between their extremities. **-Broken end:**

A warp yarn missing for a portion of its length.

-Chafe:

An area where the fabric has been damaged by abrasion or friction.

-Course end:

A warp yarn having a larger diameter than those normally being used in the fabric.
Also called heavy end.

-Color run:

The color of one area has bled or superimposed on the color of another area.

-End out:

A warp yarn missing for the entire length of the cloth. Also called missing end.

-Fine end:

Warp yarn having smaller diameter than those being normally used in the fabric. Also called tight end.

-Fuzz:

Loose or frayed fibers originating from the yarns of the fabric.

-Hard size:

An excessive quantity of size. Also called starch lump.

-Jerked-in filling:

An extra pick dragged into the fabric with correct pick for a portion of the width of the cloth, also called lash-in, pull-in.

-Kink:

A short length of yarn spontaneously doubled itself. Also called curl, kinky thread, looped yarn, snarl.

-Misread:

A warp wise streak caused by the improper spacing of the ends across the fabric.

-Mixed yarn:

A yarn that differs from that normally being used in the fabric.

-Reed mark:

A warp wise streak caused by a damaged reed,

-Shaded:

The color or bleach is not uniform from one location to another.

-Shuttle mark:

A fine line parallel to the filling caused by damage to a group of adjoining ends by the shuttle. Also called box mark.

-Slub:

An abruptly thickened location in a yarn characterized by a softness in twist and more or less of short duration.

-Smash:

An area where the fabric has been ruptured by the simultaneous breaking of a large number of adjacent warp threads

.

-Temple marks:

Small holes, wrinkles or bruises a short distance from and running parallel to the selvedge caused by the temples holding the fabric to width during weaving.

-Tendering marks:

Enlarged pinholes or distorted areas along the edge of the fabric caused by the holding of the fabric to width during finishing. Also called pin marks.

-Uneven finish:

The finish is not uniform from one location to another.

-Wrong draw:

A departure from the continuity of the weave pattern caused by one or more ends weaving in the wrong order.

4.9. Quality Inspector:

A Quality Inspector is a person who checks quality of products in raw material form or final form or in any phase of processing, such as, cutting, sewing, finishing, packing and prior to shipment. An inspector generally checks whether manufactured product conforms to quality specifications given by the buyer.

Buyer provide quality specifications in the form of order sheet/ work sheet, special, instructions, drawings and approved sample, acceptable quality level (AQL) etc.

4.10. Job description of Quality Manager & Inspectors [13]:

The Quality Manager is a very important official in a garment factory. Customer satisfaction, reputation of the company, to a large extent, depends upon him, His job description is given below:

1. He will install or maintain a right Quality Management System to ensure quality of product.
2. He will ensure that the QMS is in place & working as envisaged;
3. He will ensure that the existing QMS satisfies the buyer;
4. He will look for ways of improving existing QMS so as a exceed expectations of the customer;
5. He will ensure that buyers specifications are properly understood;
6. If there is any ambiguity/ confusion, he will confirm buyer's actual Specifications;
7. He will ensure that AQL of the company is properly maintained & exceeded.
8. He will ensure that all incoming, in-process & final goods are properly inspected & documented.
9. He will ensure that all goods coming in the store are rigorously inspected for quality & quantity;
10. He will ensure that Traffic Light Chart system of in-line inspection system is installed & working;
11. He will install both preventive & remedial measures against occurrence of any defect;
12. He is responsible for failure of quality passed garment;
13. He will ensure that all of his personnel are trained on their topics;
14. He will ensure continuous training of personal to enhance their skill;

15. He will ensure rigorous control of rejects;
16. He will ensure rigorous control of repairable & washable garments;
17. He will plan for year-wise improvement of quality;
18. He will prepare a quality manual for the company so that company's quality policy & procedures are known to all and implemented at all levels;
19. He will ensure that quality manual includes all policy, procedures, methods & measures so as to unify actions;
20. He will monitor performance of suppliers of raw-materials;
21. He will have his personnel motivated.
22. He will erasure that supplier-customer chain in maintained in the production process;
23. He will ensure that production commences only when worksheet approved sample & swatch card are at hand.

4.11. Job description of Fabric inspector [14]:

1. He inspects 10% of color wise rolls & records the result.
2. If there is any discrepancy in quality, 100% of the rolls are inspected
3. He inspects the rolls to identify general defects & shading if any
4. For general defects he will use 4 point system to penalize defects and will accept if penalty points are below 40 or otherwise specified by the buyer.
5. For shading problem, he will inspect the rolls rigorously, separate them shade wise.
6. If spectrophotometer is available, he will inspect the rolls with it.
7. He will number each roll with 3 digit code.
8. He will document the result of inspection and send them to the appropriate authority for onward submission to the supplier & buyer.

4.12. Job description of trim & accessory inspector [15]:

1. He conducts inspection of the trims for quality & quantity.

2. He conducts 10% inspection of the goods. In case of discrepancy he will conduct 100% inspection.
3. He will document the result of inspection and send them to the appropriate authority for onward submission to the supplier & buyer.

1.13. Cutting room inspector:

Cutting room inspectors inspect a number of issues like pattern, marker, spreading, cutting, numbering, not binding, etc.

1.14. Job description of pattern & marker inspectors [16] :

1. He ensures that the pattern and its grading is OK.
2. That the marker is OK and within specified consumption.
3. He documents his inspection report.

4.15. Job description of inspector for spreading, cutting, numbering, not binding [17]:

1. Checks whether fabric lay is correct;
2. Checks whether fabric lay height is correct;
3. Whether cutting is conducted correctly
4. Checks whether size & color wise bundling is done correctly;
5. Checks whether there is any defect in fabric, lining & interlining etc.

4.16. Job description of line inspector [18]:

1. He ensures that all inputs are covered so that they do not stain.
2. He detects defects at needle point and at a very preliminary stage.
3. Checks if there are defects due to fault in machine, needle, thread or feed mechanism etc.

4. Checks if right color & types of thread, button, zipper, lining, shell, label, logo, etc have been used;
5. Checks if buyer's instructions are followed;
6. Ensures that machines, tables, operators' hand, floor are clean & free of dust & dirt etc.
7. He checks all processes in a production line on random basis;
8. He marks defects on a specially designed chart (traffic light chart)
9. He identifies the highest 3 defects in the line
10. He identifies defect level, defect rate etc.

4.17. Job description of table inspector [19]:

1. He conducts 100% inspection of all goods on an inspection table;
2. He checks the garments zone- wise
3. Checks all types of defects and rejects, defective garments;
4. Checks if there is any oil or, stain mark, needle mark, point up down etc.
5. Compares buyer's specifications with actual garment quality;
6. Checks size specs rigorously;
7. Checks if right color & type of thread, button, zipper, lining, shell, label etc have been properly attached;
8. Takes special care about major defects and defects in the most critical areas.
9. He carefully inspects issues about which there is special instruction of the buyer.
10. He passes goods, which conform to buyer's specification
11. He segregates rejects and transfer them to the authorized inspector / quality manager.
12. He keeps repairable & washable garments in separate baskets assigned for each type.
13. He ensures that repaired & washed garments come to him separately for reinsertion.

14. He ensures that there are a few category of separate baskets one group for incoming sewn goods, one group for rejects, one group for washable garments, one group for repairable garment & one group for passed goods. These baskets should be easily identifiable.

4.18. Job description of lot pass inspector [20]:

Lot pass is a SQC technique used on goods that underwent table inspection. This is a reinforced inspection to ensure quality.

1. He takes a lot of good passed by table inspectors and counts the number of goods in the lot;
2. He draws sample from the lot using a normal/ tight sampling plan and an AQL of preferably 1.5%
3. He inspects the garments of the sample size;
4. If the number of rejects exceeds Accept # of the Sampling Plan, rejects the lot to the table inspectors for re-inspection, otherwise accepts it.

4.19. Job description of finishing inspector [21]:

1. He controls heat of the iron so that goods are not damaged by over heat;
2. He ensures that goods are folded as per standard practice or as per instruction of the buyer.
3. Ensures cleanliness of finishing tables;
4. Checks for defects & rejects;
5. Takes special are about oil mark, stain mark etc.
6. He checks if puckering develops after washing or ironing of garments.
7. Inspects goods before poly packing
8. Ensures buyer specified assortment;
9. Ensures that finished & packed garment matches approved finished garment;
10. Ensures quality of packaging, side marks of cartons, etc.

4.20. Job description of final inspector [22]:

Final inspector generally conducts pre-shipment inspection, which is often called final inspection.

1. Ensures that the whole consignment (lot) is stacked at one place;
2. Ensures that samples are drawn from the lot on random basis;
3. He inspects each sample and records outcome;
4. He counts the number of rejects out of the sample size;
5. He compares it with that allowed as per inspection sampling plan
6. If number of rejects exceed allowable limit given in the Inspection Sampling Plan, he rejects the lot. Otherwise accepts it.
7. Checks whether assortment matches buyer specified assortment;
8. He checks if poly bags, cartons, inners, etc are of specified quality;
9. He checks shipping mark & side marks, gross and net weight etc.
10. He checks if destination is correctly given.

1.21. In Process inspection [23]:

It must examine different parts of garments before sewing is called in process inspection. There are so many facilities for inspection in every section of garments industries from spreading to finishing. The aim of inspections is to reduce the time and cost by identifying the faults or defects in every step of garments making. If defects are identified in primary steps, these can be solved at a low cost. It was seen in a statistics that, 15% to 20% operators are responsible for 65% to 80% defects of garments. That's why it can be minimized by in process inspection.

The following are the Steps can be taken in every step of garments making to gain the desired quality.

1.22. Marker making:

It is a thin paper which contains all the necessary pattern pieces for all sizes for a particular style of garments. It Gives Special instructions for cutting. It can be done both manually and computerized method.

- In Computerized method all information's are stored in the pre-fashioned data file and an operator helps the computer to make the best choice.
- Marker width is taken according to the fabric width. Fabric spreading should be done by taking the guideline from marker length

The following are the points should be considered before marker making:

- Fabric width must be higher than marker width ($\frac{1}{2}$'')
- Fabric width must be higher than marker length (1''+1'')
- When pattern pieces are laid down on the layer of fabric, the grain line should be parallel to the line of the warp in a woven fabric and Wales in knit fabric where pattern pieces are laid across the layers, the line is kept parallel to weft/course.
- All the pattern pieces of a garment should be along the same direction when laid down on an asymmetric fabric.
- Length of cutting table should be considered.
- Plan for garments production should also be considered.

4.23. Fabric Spreading.

The following are the reasons for which quality of garments are hampered must be considered:

- Correct ply direction and lay stability:
- Elimination of static electricity:
- Alignment of fabric ply
- Correct ply tension:
- Fabric must be flat:
- Elimination of fabric flaws:
- Easy separation of the cut lay into bundles:

- Avoidance of fusion of plies during cutting :
- Avoidance of distortion in spread:
- Matching checks and stripes

4.24. Fabric cutting:

The following are the points should be considered before fabric cutting:

■ Precision in cut i.e. the dimension of pattern and fabric parts is cut must be same.

* The cut edge should be cleaned
* Infused edge
* Consistency in cutting
* Support of lay
* Proper notch size. If is large in size, can be seen after sewing of fabric. Also there is a great possibility of occurring in matching of patterns after sewing.
* Drill hole and size must be appropriate and will be placed in proper place. If it is too small can be blocked easily.
* Fabric Sewing: The following are the defects should be identified and must be made defect free in the sewing section:

□ sewing defects:

* Needle damage: For example, thread drawn-off from the fabric or making of large hole to the fabrics. * Skipped stitch
* Thread drawn-off
* Seam pucker
* Wrong stitch density
* Uneven stitch
* Staggered Stitch

* Defected Stitch
* Oil spot or stain

■ seaming defects:

* Uneven width
* Uneven Seam line
* Not secured by back stitch
* Twisting
* No Matching of cheek or stripe
* No Matching of seam
* Unexpected materials are attached with the sewing
* Not sewn by matching face side or back side of fabrics.
* Use of wrong stitch type
* Wrong shade matching of thread

■ Assembly defects:

* Defected finished components by size i.e. imperfect size & shape of finished components.

*Imperfect garments size
*Use of wrong ticket
*Massing of any parts or predetermined design of garments
* Imperfect alignment of components (i.e. button, hook and so on) in proper place
* wrong placing or creasing of interlining
* Looseness or tightness of interlining
* Folding of any parts of garments that is seen to bad appearance
* Shade variation of garments
* False direction of fabrics parts in the garments
* Imperfect matching of trimming in the garments

4.25. Pressing or finishing:

The process by which unwanted crease and crinkle are removed with the view of increasing smoothness, brightness and beauty of the garments is called pressing. In the Garments Industries it is called ironing. This process plays an important role to grow attractiveness to the buyers.

The following are the matters must be inspected during pressing:

- Inspected for fused area or fused stain if any.
- Inspected for water spot if any
- Inspected for shade variation area if any
- Inspected for correct folding of garments
- Inspected for crinkle area and rough surface if any
- Inspected for stretched garments area during pressing if any
- Inspected for proper drying of garments area during pressing if any
- Inspected for proper drying of garments after pressing
- Inspected for crinkle area and rough surface of pocket if any
- Inspected for unexpected crease in lining
- Inspected for proper shape

This is also informed that, the temperature, pressure of pressing head and time during pressing must be inspected

CHAPTER-V

COST OF QUALITY

1.1. Quality Cost [24]:

Any activity in business must contribute to overall profits; otherwise it cannot exist and quality control is no exception Management of quality function should remember that senior management often considers quality primarily a business problem a matter of marketability and economics for example return on investment and only secondarily a matter of technology for example statistical sampling Therefore a quality control manager should be able to communicate with senior management in terms of costs profits investments returns, etc. and not only in light of production per cent defective sampling, etc.

1.2. Importance to know cost of quality or keep track of quality costs:

1. Quality cost analysis can be used to identify areas of opportunity for improving quality and reducing costs.

2. Quality costs will give the quality control manager something to talk to senior management about in order to prompt not only corrective actions but also some preventive actions. By showing how much poor quality actually costs, senior management commitment can be enlisted in quality improvement efforts.

3. The performance of a quality control department can be evaluated in financial terms and it can be determined how much cost is involved in achieving a certain level of quality and whether the quality control department is paying its way or not.

4. It will help one budget realistically to achieve a desired quality level. Aside from the above reasons, since the cost of quality has a direct impact on the profitability of any company, it is natural that senior management would be interested in knowing the cost of quality. According to Juran and Gryna

5.3. Quality affects the company's economics in two basic ways:

1. Effect on income. With superior the company can secure a higher share of market, firmer prices, a higher percentage of successful bids, and still other benefits to income. It is this effect on income which makes quality have value.

2. Effect on cost. It costs money to build quality, to control, to pay for the failures.

5.4. The ASQC Quality cost committee recommends breaking down quality costs into the following four areas:

1. Prevention cost:

The costs associated with personnel engaged in designing, implementing and maintaining the quality system maintaining the quality system includes auditing the system.

2. Appraisal cost:

The costs associated with measuring, evaluating, or auditing of products, components, and purchased materials to assure conformance with quality standards performance requirements.

3. Internal Failure cost:

The costs associated with defective products, components and materials that fail to meet quality requirements and result in manufacturing losses.

4. External Failure cost:

The costs generated when defective products are shipped to customers.

5.5. In the context of garment manufacturing various quality costs can be divided as follows:

1. Prevention costs:

Cost of planning various quality functions, cost of evaluating prototype samples (whether testing or wear trials of both), cost of writing specifications, and cost of personnel performing such activities.

2. Appraisal costs:

Inspection costs, testing cost, personnel costs associated with inspection and testing. Testing costs would include cost of the sample destroyed in testing,

laboratory supplies, etc. It can also be cost using commercial testing laboratory or cost of third party testing.

3. Internal failure costs:

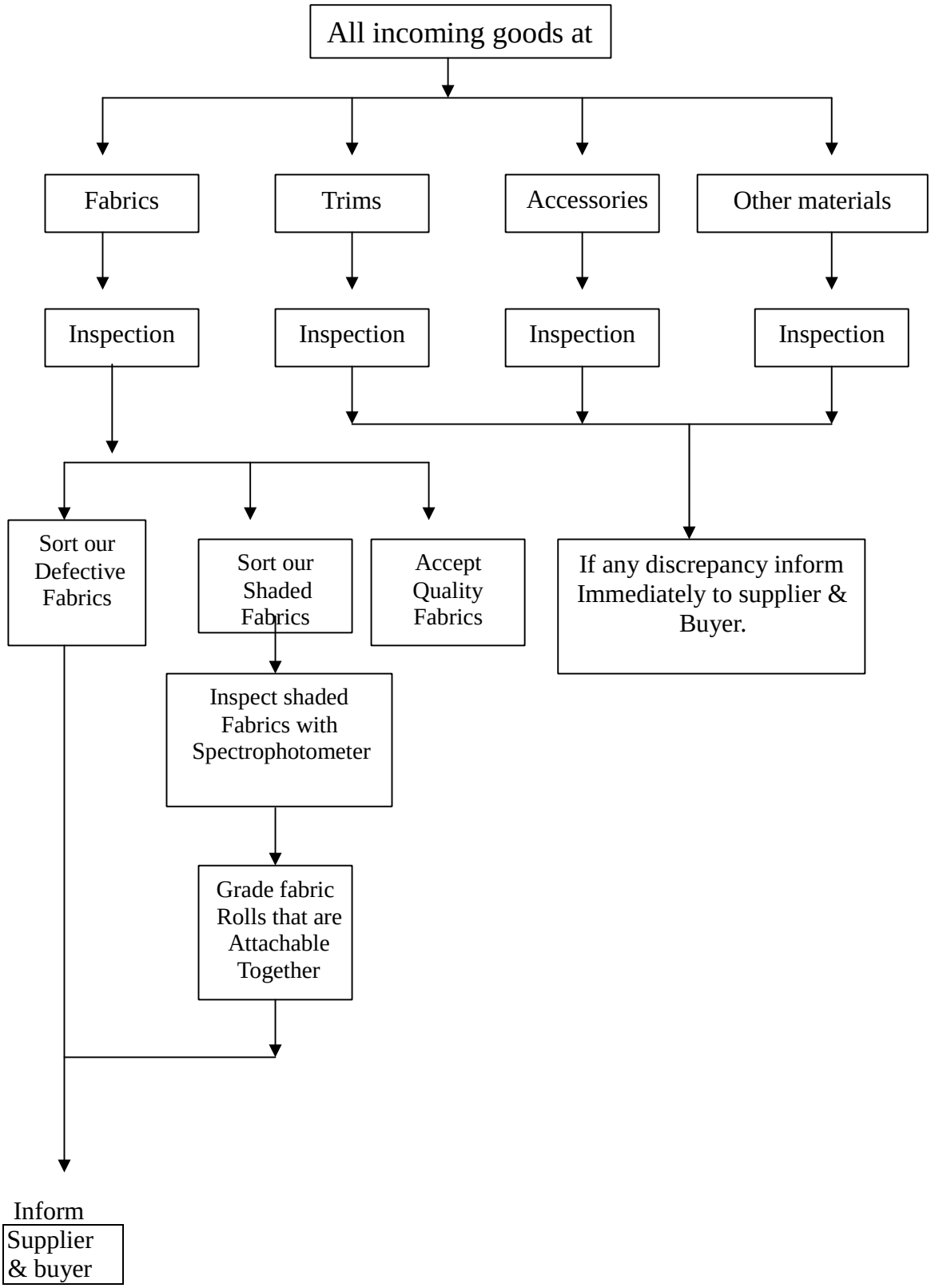
Repair work costs, scrap costs, cost of reinsertion, personnel costs associated with these activities.

4. External failure costs:

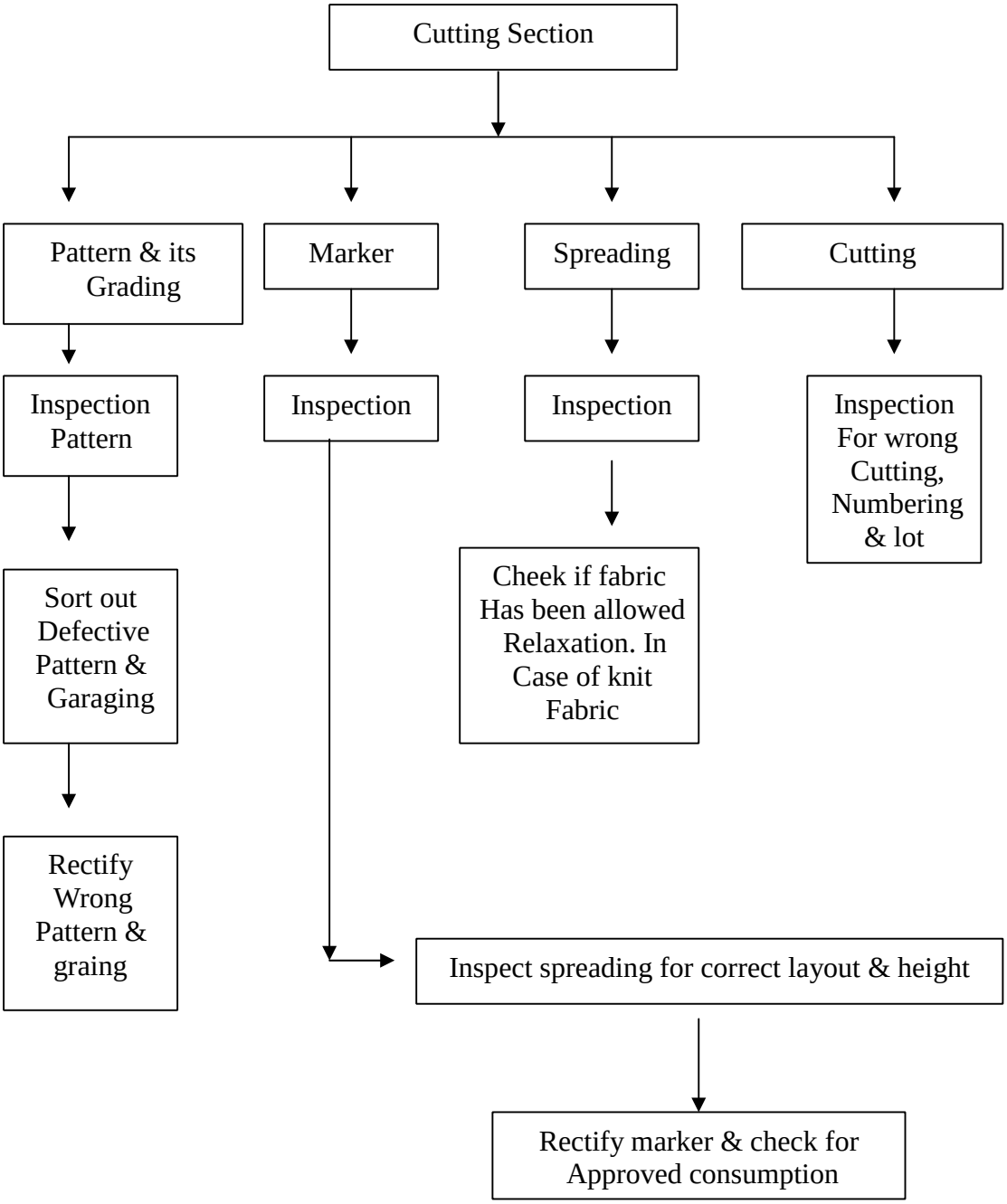
Cost of returned merchandise, cost of claims, and cost of transportation for the defective merchandise personnel costs associated with these activities.

Quality can be measured and reported in many ways other than the traditional way (prevention, appraisal and failure costs). This has been explained by saliva.

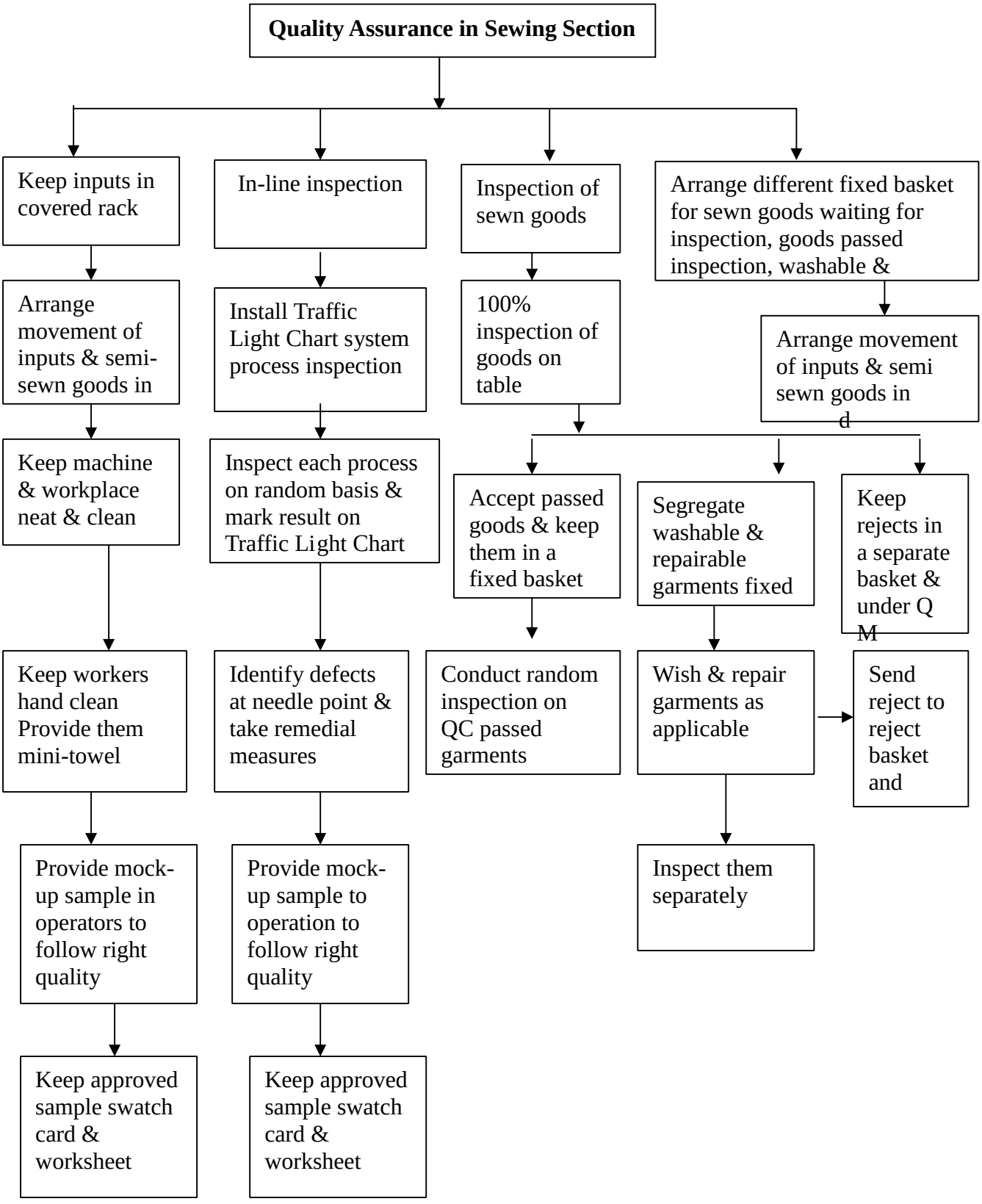
5.6. Quality assurance in the store [25]:



1.7. Quality assurance in Cutting [26]:



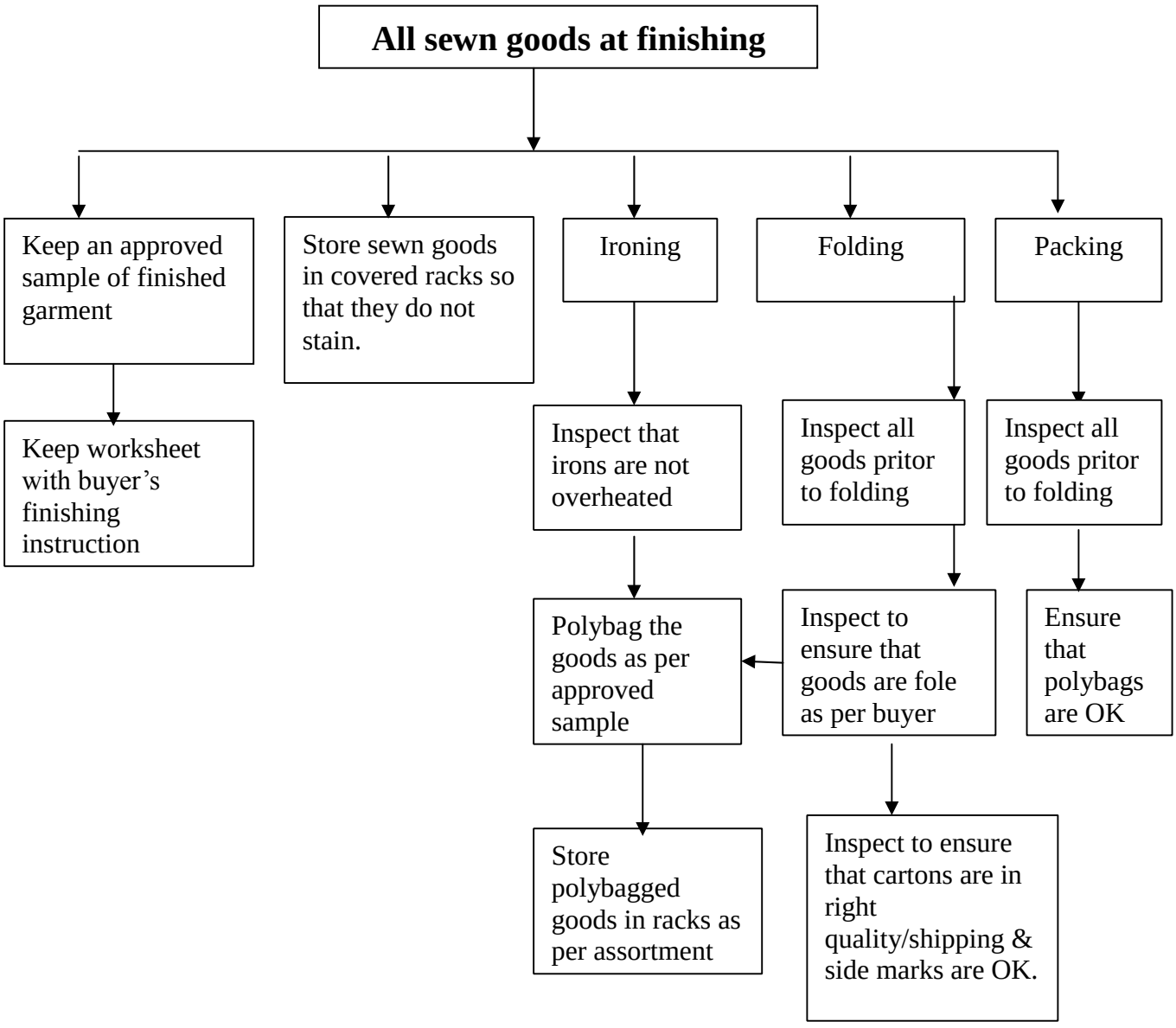
1.8. QUALITY ASSURANCE IN SEWING [27]:



1.9. QUALITY ASSURANCE IN FINISHING DEPARTMENT [28]:

Finishing department plays a vital role in maintaining and enhancing Quality of goods. It is generally said that smart finishing is 50% of quality, because end-users find the merchandize in finished from in polybag in a store. So it is essential to inspection at all

Delivered to the customer.



stage of finishing so that smartly finished merchandize may be

CHAPTER-VI

STATISTICAL QUALITY CONTROL

1.1. Statistical Quality Control [29]:

-Overview

-History

-Background Information

-Uses of Control Charts

-Types of Control Charts

-Analysis of Patterns on Control Charts

-Software

1.2. Overview:

This page has been designed to help in understanding and learning the use, design and analysis of Control Charts, which is the most important tool of Statistical Quality Control.

The information has been formatted in the form of a tutorial, which will guide you through the process. It includes the history, background information, the uses, the types with examples, analysis of patterns, related software and additional sources of information about control charts.

1.3. History [29]:

Control charting is one of the tools of Statistical Quality Control (SQC) it is the most technically sophisticated tool of SQC. It was developed in the 1920s by Dr. Walter A. Stewart of the Bell Telephone Labs.

Dr. Stewart developed the control charts as an statistical approach to the study of manufacturing process variation for the purpose of improving the economic effectiveness of the process. These methods are based on continuous monitoring of process variation.

1.4. Background Information:

A typical control chart is a graphical display of a quality characteristic that has been measured or computed from a sample versus the sample number or time. The chart contains a center line that represents the average value of the quality characteristic

corresponding to the in-control state. Two other horizontal lines, called the upper control limit (UCL) and the lower control limit (LCL) are also drawn. These control limits are chosen so that if the process is in control, nearly all of the sample points will fall between them. As long as the points plot within the control limits, the process is assumed to be in control, and no action is necessary.

However, a point that plots outside of the control limits is interpreted as evidence that the process is out of control, and investigation and corrective action is required to find and eliminate the assignable causes responsible for this behavior. The control points are connected with straight line segments for easy visualization.

Even if all the points plot inside the control limits, if they behave in a systematic or nonrandom manner, then this is an indication that the process is out of control.

6.5. Uses of Control charts:

Control chart is a device for describing in a precise manner what is meant by statistical control. Its uses are

It is a proven technique for improving productivity.

It is effective in defect prevention.

It prevents unnecessary process adjustments.

It provides diagnostic information.

It provides information about process capability.

6.6. Types of control charts:

1. Control charts for Attributes.

p chart *c*

chart *u*

chart

2. Control charts for Variables.

X bar chart

R chart

6.7. Analysis of Patterns on Control Charts:

A control chart may indicate an out-of-control condition either when one or more points fall beyond the control limits, or when the plotted points exhibit some nonrandom pattern of behavior.

The process is out of control if any one or more of the criteria is met.

1. One or more points outside of the control limits. This pattern may indicate:

- A special cause of variance from a material, equipment, method, or measurement system change.
- Mismeasurement of a part or parts.
- Miscalculated or misplotted data points.
- Miscalculated or misplotted control limits.

2. A run of eight points on one side of the center line. This pattern indicates a shift in the process output from changes in the equipment, methods, or materials or a shift in the measurement system.

3. Two of three consecutive points outside the 2-sigma warning limits but still inside the control limits. This may be the result of a large shift in the process in the equipment, methods, materials, or operator or a shift in the measurement system.

4. Four of five consecutive points beyond the 1-sigma limits.

5. An unusual or nonrandom pattern in the data.

A trend of seven points in a row upward or downward. This may show Gradual deterioration or wear in equipment.

Improvement or deterioration in technique.

Cycling of data can indicate

Temperature or other recurring changes in the environment.

Differences between operators or operator techniques.

Regular rotation of machines.

Differences in measuring or testing devices that are being used in order.

6. Several points near a warning or control limit.

6.8. Seven Tools of Quality [30]:

Collecting and analyzing data is a foundation on which the effective management of quality rests. The so called `Seven tool of quality` Will help you effectively collect and analyze data.

The Seven tools quality are:

1. Cause and effect diagram
2. Check sheet
3. Control Chart
4. Flow Chart
5. Histogram
6. Pareto Chart
7. Scatter diagram

A Summary of those tools is provided here. Please note that the explanation provided is very basic and simple. For a detailed and excellent discussion of these tools please refer to.

CHAPTER-VII

CONCLUSION & REFERENCE

Conclusion:

Now a days Textile field become very competitive and the buyer wants 100 % export quality product. For this reason, it is very important to know about the latest technologies in textile sector. To produce a quality Product, as a Textile engineer I must have a vast knowledge about the production Parameters and how to produce high quality product & Techniques of productions and the management system.

Therefore, I think this project will help me in future.

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