

QUALITY IMPROVEMENT IN GARMENTS INDUSTRY THROUGH TQM APPROACH

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ABSTRACT

Total Quality Management (TQM) is one of the important tools to improve quality and reduce manufacturing cost by reducing rework and scrape. There has a great applicability of TQM method in RMG sector. Several implementations have proven that the TQM approach really works in practice and improves of even 90% and more quality level in some situations. As RMG sector is a large industrial sector in Bangladesh; Quality Improvement can play a vital role for improving productivity as well as economic development for the country. We have used the tools of TQM such as Flow chart, Check sheet, 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 scrape per style, per month has minimized by applying this method. The implementation has enabled to reduction in rework and cost of poor quality, through proper utilization of company's internal resources without the need for significant investment.

Keywords: TQM, RMG, Rework, Quality Improvement, Cost of Poor Quality.

1. INTRODUCTION

The term total quality management (TQM) has become a buzz-word now-a-days. It refers to organization wide effort to achieve quality. It can accurately be described as a philosophy about quality that suggest for involving everyone in the organization in a quest for quality. It extends to suppliers as well as to customers. In fact, in TQM, the customer is the focal point, as the business is driven by customers. As such, customer's satisfaction is the main driving force. Everyone in the organization, from the top most chief executive, up to the bottom most workers, has to take part in this endeavor. Achieving world class quality is not just another program; it is an ongoing process [1, 2 and 3]. The definition of TQM is a term created by the U.S. Naval Air Systems as: TQM stands for "Total Quality Management". An organization uses TQM as a long term approach to achieving customer satisfaction. Total Quality Management requires all employees of the organization for improving the products, processes and services. All employees, no matter what role, are responsible for quality and quality assurance. When done correctly, the entire business culture is TQM [2].

A manufacturing company that possesses many complexities can be highly challenged when maintaining production goals and standards in conjunction with a major organizational change. Garment manufacturing is a complex industry for many reasons. The product line is a complex array of styles, seasons, varying life cycles, and multidimensional sizing [4]. Many sewn product

firms are viewing TQM as the appropriate strategy to meet the double demand of competition and quality; however, many companies are finding sustaining their TQM adoption decision very difficult. Additionally, TQM's contribution to a competitive advantage remains unexamined with the context of management and organizational development research [5].

In this research, we have adopted the definition of TQM as a management approach for an organization, centered on quality, based on the participation of all its members. It focuses on long-term success through identifying and prioritizing customer requirements, setting and aligning goals, and providing deliverables that warrant customer satisfaction (as well as customer delight). However, the main theme of the research is how to improve quality of a garment industry by implementing TQM in practice, which is a real challenge. TQM applications vary widely with product category, organizational settings, management philosophies and practices and so on [6 and 7]. In practical business settings, implementation of TQM requires a great deal of change in most organizations. This involves three spheres of changes in an organization- people, technology and structure.

2. PROBLEM FORMULATION

In Garments manufacturing, division of labor is applied to make a complete part by using several man and machine according to the sequential operations where that's have some term and condition to maintain the customer satisfactory level e.g. quality and productivity. When manufacturing products is in large

scale, some of variables are there like as Operator, Skill, Process, Machine etc. As in garment industries in Bangladesh most of the operations are performed by Operator (human) so the deviation of quality requirement is high which mostly comes from Operator, Machine, Method, Material and Working environment. For quality problem a factory has to done a remarkable rework which increase manufacturing cost as well as decreases productivity. Total Quality Management (TQM) is an approach that organizations use to improve their internal processes and increase customer satisfaction [8].

3. RESEARCH OBJECTIVES

The objectives of the study are:

1. To identify the basic pillars required to implement TQM in practice and
2. To improve the quality of a garment industry of Bangladesh by implementing TQM approach.

4. METHODOLOGY

The research methodology consists of three major steps.

- Firstly, an extensive literature review has been conducted to identify the pillars required to implement TQM in practice.
- Secondly, conduct an analysis of product quality to find the current status. (Define the Defects Name, Data Collection to find the Frequency of defect, Analysis with TQM tools)
- Thirdly, Implementation to improve quality.

4.1. PILLARS OF TQM IMPLEMENTATION

The definition of TQM may sound simple, but the implementation of it in practice requires an organizational culture and climate. It takes time and patience to complete the process. The process does not occur overnight, the results may not see for a long period of time. Some experts say that it takes up to ten years to fully realize the results of implementing quality management. There are several steps that must be taken in the process of shifting to quality management in an organization. According to Jablonski [6], he identified six attributes for successful implementation of TQM program. Those are: Customer focus, Process focus, Prevention verses inspection, Employee empowerment and compensation, Fact-based decision making, Receptiveness to feedback. Another perception about TQM is: Customer Defined Quality; Top Management Leadership; Primary focus on strategic planning; Employee responsibility at all levels of the organization; Focus on continuous quality improvement to achieve strategic goals; Cooperative efforts between Employees and Management; Utilization of Statistical Process Control (SPC); and Continuous improvement through training and education of the whole workforce [7]. Another well-known famous writer said in his book some distinguishing characteristics about TQM. Those are: Continual improvement; Customer focus; Organization-wide activity; Employee empowerment; Team approach; Competitive benchmarking; Knowledge of quality control tools; Internal and external customers; and Long term relationship with suppliers [1].

From the literature, we have gathered thorough knowledge about the foundation of TQM. Some authors propose four pillars, while the others propose nine pillars for a successful implementation of TQM. However, adopting the scholars' guidelines in identifying pillars of TQM implementation, we have selected 11 pillars, which are presented in Table-1. The brief description of each pillar is given afterwards. Note that the order of the pillars placed in the table does not represent the relative importance of the pillars.

Table-1: pillars of TQM implementation

1.	Creation of Quality Management (QM) environment
2.	Introduction of workers to total quality management (TQM)
3.	Using of statistical control technique for measuring quality
4.	Identification of the appropriate starting place
5.	Sharing information with everyone for decision taking
6.	Encouraging cooperation and teamwork
7.	Customer focus as an element of design,
8.	Modification of reward systems
9.	Selection of right raw materials
10.	Benchmarking
11.	Building continuous improvement the goal

Creation of Quality Management (QM) environment

Quality Management environment is one in which all employees have basic knowledge about quality. They should be safety conscious and use safety devices and follow appropriate tools and techniques. From top management to the worker, should concern with quality first.

Introduction of workers with TQM

Workers must constantly be trained with the tools and techniques that are needed to upgrade the company's quality. Workers must understand the philosophy of quality management (QM) before be user of the tools and techniques.

Use of statistical process control (SPC) tools

To ensure gains in quality, the results must be measured by using of statistical control technique as the company progresses toward its quality objectives. This requires that employees be trained to use SPC tools and techniques. Without knowledge of using quantitative tools, the organization cannot achieve the intended TQM results.

Generation of starting point

One of the most difficult tasks in the beginning phases of implementing TQM is to determine where to start and when to start. One approach to this beginning is to assume that 80 percent of all the company's problems stem from 20 percent of the company's processes (Pareto's Law). By identifying the problematic processes that fall in this 20 percent category, one can begin to focus on what needs attention first. Focusing attention on

these problems first, the organization would have bigger payoffs and could build momentum for the future.

Information sharing in decision taking

If a team approach is to be used and if employees are expected to be involved in the decision-making process, it is imperative that information be shared with everyone. In the strategic decision-making process root level workers' opinions should directly or indirectly be involved.

Encouraging cooperation and teamwork

In many organizations that do not follow TQM philosophy, managers are often on the hunt for someone to blame for problems that are found. This type of environment creates unhealthy stress and discourages innovative thoughts and practices of employees. The combination of a team approach and QM means seeking to improve the system when problems arise.

Customer focus as an element of design

From beginning to end, customer satisfaction should be the focal point of the quality management system. This means that the goal of customer satisfaction must be incorporated in the planning processes and then maintained day in and day out.

Modification of reward systems

Reward systems need to be overhauled periodically to recognize and encourage teamwork and innovation. The team, not the individual, is the foundation for TQM companies. Traditional pay plans are often based on seniority, not on quality and performance. With TQM, pay systems focus on team incentives. If one person in the team doesn't perform at the expected level, the team members will normally handle the situation. Thus, team based reward can motivate the members in achieving the targets.

Selection of right raw materials

Achievement of product quality needs to collect right raw materials at due time. For this, every organization need to build up long term trust-based relationship with supplies and engage combined effort to ensure the quality and availability of raw materials.

Benchmarking

Benchmarking is a continuous, systematic procedure that measures a firm's products, service, and process against those of industry leaders. Companies use benchmarking to understand better how outstanding companies do things so that they can improve their own operations [9].

Building continuous improvement goal

Processes and products should continually be improved. There is no end to the improvement process. This is true for even the best of the best companies. Total quality management never ends.

4.2 ANALYSIS OF PRODUCT QUALITY

Analysis is the resolution or breaking up of something complex into its various simple elements [10]. Quality is no doubt a complex phenomenon. Quality analysis is a business practice (within a company, (sub) sector or trade) aiming at improving quality of products and/or services [11]. In any case quality analysis is a process attempting to determine the actual level in order to find ways and means resulting in quality improvement. The most important methods of quality analysis are TQM tools, such as check sheet, histogram, pareto chart, process flow chart, cause-effect diagram.

Define the Defects Name

In garments industries the defects which causes rework and reduces the efficiency are as oil stain/spot, skip stitch, pleat, dirty spot, point up down, open seam, needle cut, raw edge, join stitch, insecure stitch, uneven stitch, shading, needle mark, broken stitch, uncut thread, puckering, label missing, reverse etc.

Data Collection (Frequency of Defect)

The check sheet also called a 'Defect Concentration Diagram' is basically a data collection sheet [1]. By using check sheet we have collect the frequency of defect. The entire defect is not occurred in same frequency, some defect is appearing very frequently and some is in less frequent.

Table -2: Check Sheet (Used for data Collection)

Quality Inspection-100% (Sewing)											
Style No.	Order No.			QC Name:			Line No.			Date:	
	8.00-9.00	9.00-10.00	10.00-11.00	11.00-12.00	12.00-1.00	2.00-3.00	3.00-4.00	4.00-5.00	5.00-6.00	6.00-7.00	
No. of Pieces Checked											
Total Defects											
Hourly DHU											
Supervisor											
Line Quality Head											
Operations	Defect Codes										
TOTAL											
Defect Wise DHU											
Code	Defect	Code	Defect	Code	Defect	Code	Defect	Code	Defect	Code	Defect
301	Broken Stitch	305	Dirty Spot	309	Embroidery Defect	313	Fabric Loose	317	Join Stitch	321	Lytra Missing
302	Button Attach	306	Distorted Shape	310	Fabric Bias	314	Hi-Low	318	Label Missing	322	Needle Cut
303	Button Hole	307	Down Stitch	311	Fabric Defect	315	Iron Problem	319	Label Mistake	323	Needle Mark
304	Defect Button	308	Dyeing Spot	312	Fabric Hole	316	Insecure Stitch	320	Lack Defect	324	Oil Spot

Table- 3: Defect Name and Defect Qty.

Defect name with code	Defect Qty.
Oil Spot (324)	7571
Dirty Spot (305)	5609
Skip stitch (334)	7089
Pleat (326)	3009
Open seam (325)	1826
Point up down (327)	1441
Uncut thread (339)	1413
Uneven stitch (340)	250
Reverse (331)	1246
Broken stitch (301)	67
Tack missing (344)	20
Button attach(301)	495
Tension bad (336)	207
Raw edge (330)	977
Down stitch (307)	106
Dyeing spot (308)	59

Label missing (318)	80
Puckering (329)	58
Fabric hole (312)	27

Analysis with TQM Tools

Pareto Chart

Pareto chart, also known as Pareto analysis is a statistical technique in decision making that is used for selection of a limited number of tasks that produce significant overall effect. It uses the Pareto principle – the idea that by doing 20% of work, 80% of the advantage of doing the entire job can be generated. Or in terms of quality improvement, a large majority of problems (80%) are produced by a few key causes (20%) [1,12].

All the data collected by check sheet has been plotted in pareto chart and found the 20% defects that causes of 80% problems. The 20% defects are Skip Stitch, Dirty Spot, Oil Spot, Open Seam, Pleat, Raw edge, Uncut thread etc.

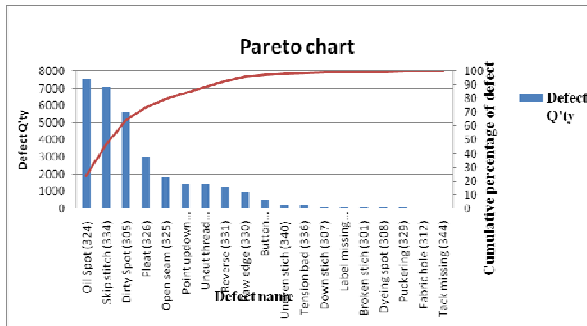


Fig 1. Pareto Chart of all defects

Process Flow Chart

Process flow chart is a graphical tool that shows the major steps in process. Flow charts are useful tool for examining how various steps are related to each other. By studying this chart individuals and teams can often uncover potential sources of trouble and identify steps to be taken to improve or error proof a process [1].

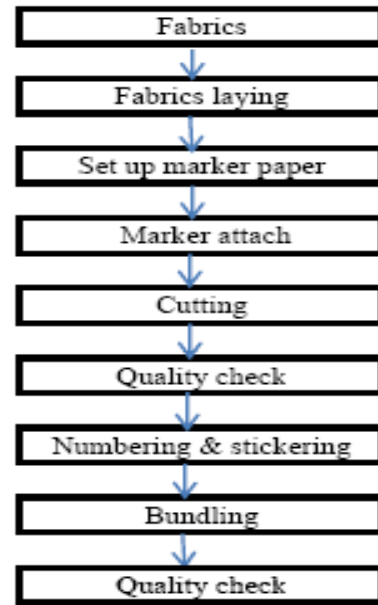


Fig 2. Process Flow Chart of Cutting Procedure

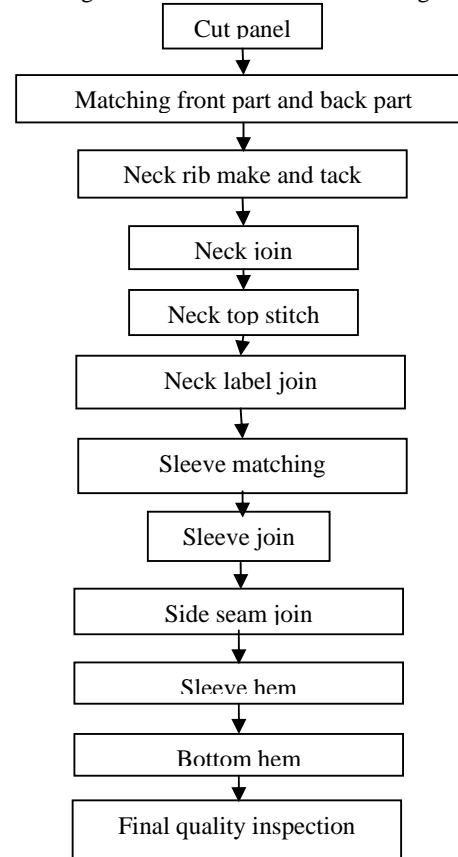


Fig 3. Process Flow Chart of T-Shirt (Sewing)

Cause-Effect Diagram

Cause-and-effect diagram is a chart that identifies potential causes for particular quality problems. They are often called fishbone diagram.

These causes could be related to the machines, workers, measurement, suppliers, materials, and many other aspects of the production process. For example, a

problem with machines could be due to a need for adjustment, old equipment, or tooling problems. Similarly, a problem with workers could be related to lack of training, poor supervision, or fatigue.

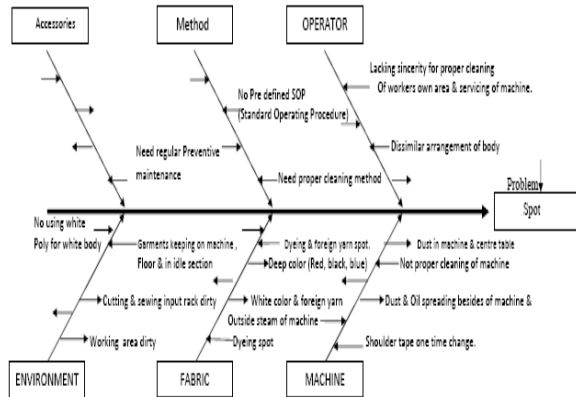


Fig 4. Cause and Effect diagram of Spot

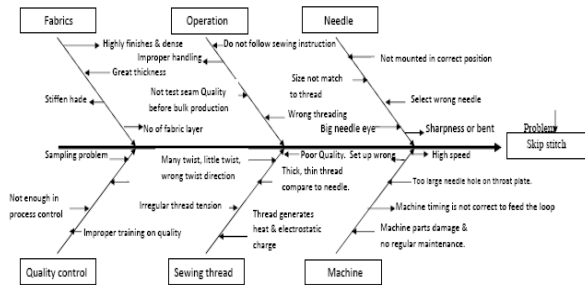


Fig 5. Cause and Effect diagram of Skip Stitch

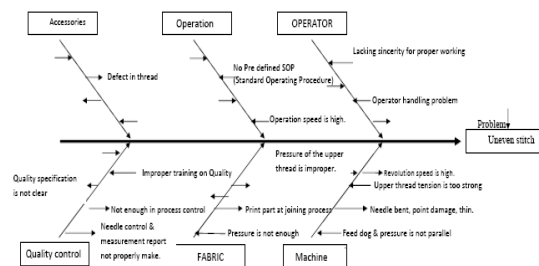


Fig 6. Cause and Effect diagram of Uneven Stitch

Control Chart

The control chart is a graph used to study how a process changes over time. Data are plotted in time order, or on sample basis. A control chart always has a central line (which is the target value, for the process average), an upper line for the upper control limit and a lower line for the lower control limit. These lines are determined from the collected data. By comparing current data to these lines, conclusions can be drawn about whether the process variation is consistent (in control, affected by natural chance causes) or is unpredictable (out of control, affected by special causes of variation).

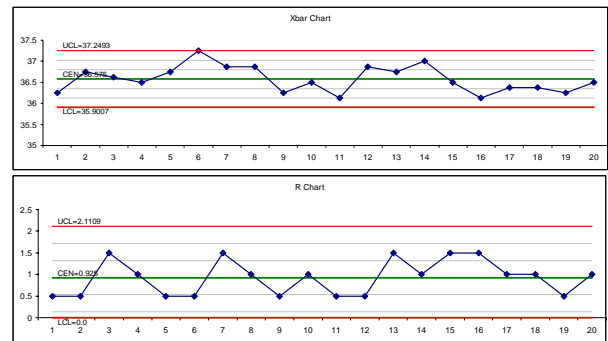


Fig 7. Control Chart of Measurement deviation (T-shirt)

4.3. IMPLEMENTATION

The implementation phase is divided in two steps: one is establishing the pillars of TQM and another is implementing the TQM tools to improve product quality.

TQM Pillars

Creation of Quality Management (QM) environment

We arranged so many trainings on basic knowledge of quality, safety issue, use of safety devices etc for the employees dividing them into different groups, this training covers all levels of employees from top management to workers.

Introduction of workers with TQM

Workers are trained with the tools and techniques that are needed to upgrade the company's quality. Workers are understand the philosophy of quality management (QM).

Use of statistical process control (SPC) tools

Employees are trained to use SPC tools and techniques

Generation of starting point

As our concern is to improve quality of a garment industry so we start from product quality. Product quality improvement means reduction of defect and rework to do so we applied pareto analysis to define the start point of reducing defect.

Information sharing in decision taking

We have started the team approach; teams are formed among employees to solve the quality related problems. Now employees are involved in the decision-making process.

Encouraging cooperation and teamwork

The approach of encouraging cooperation and teamwork has started and the blaming culture has eliminated. This environment creates encourages innovative thoughts and practices of employees. The combination of a team approach and QM means seeking to improve the system when problems arise.

Customer focus as an element of design

We trained the employees about the customer satisfaction and now it is considered that customer satisfaction is the focal point of the quality management system. This means that the goal of customer satisfaction must be incorporated in the planning processes and then maintained day in and day out.

Modification of reward systems

We have started the reward system to encourage teamwork and innovation. Traditional pay plans are often based on seniority, not on quality and performance. We modified traditional pay plans which focus on team incentives.

Selection of right raw materials

Achievement of product quality needs to collect right raw materials at due time. We always try to select right raw material and we encouraged to build up long term trust-based relationship with supplies and engage combined effort to ensure the quality and availability of raw materials.

Benchmarking

We started the Benchmarking procedure to measure our products, service, and process against those of industry leaders

Building continuous improvement goal

We set a improvement goals for every two month to continual improvement of Processes and products.

Findings by TQM tools:

After defining what problems are appears frequently and causing 80% defect by pareto chart, then we find out the root cause of these problems. We take action against the root cause to reduce or eliminate the problems. We take the following initiative to solve the problems.

Oil/Dirty Spot: Clean machine properly twice in a day, wash hands of operator before starting work and after lunch, establish preventive maintenance, improve oil control system of machines, practicing 5S in work place.

Skip Stitch: Use needle which design to facilitate loop formation, Adjust the needle height and testing before bulk sewing, Check needle is properly mounted on the sewing machines with right eye position, Choice of sewing thread in accordance with the needle size, Select good quality thread which is free from flaws, Repair damage machine parts, Reduce gap between presser foot and the hole of needle plate, Provide adequate training to the operators.

Pleat: use right pressure feed to pass the upper and lower part of fabrics uniformly, correct the material handling system of operator, observe the pressure feed to ensure there is no dust or foreign material etc.

Uncut Thread: Provide thread cutter to every operator and make used to; to cut thread properly, start regularly checking system to check the auto trimming machine is properly functioning or not, improve quality inspection system.

Uneven Stitch: Control the speed of machine, use right needle, correct feed control, improve the skill of operator, use good quality sewing thread, and provide standard quality specification.

5. RESULTS

Table- 4: Result Analysis after TQM implementation

Area	Before Implem entation	After Implementat ion	Improve ment
Defect %	9.89	5.24	47%
Repair/Rework %	6.20	2.25	36%
Reject/Scrap %	0.53	0.32	40%
Quality %	89.58	94.44	5%
Efficiency %	44.2	49.8	13%
Team Approach	Not Strong	Stronger than previous.	Improve d
Reward System	No	Yes	Improve d
TQM Knowledge of workers	No	Yes	Improve d

In the above table the improvement is shown as in the percentile value of base level (before implementation of TQM).

6. CONCLUSION

In today's competitive market, no organizations could survive without continuous improvement in their product quality and process, by focusing on ultimate customer. In our study, we try to see how an organization should implement TQM and how to improve quality by implementing it. It is found that a garment industry can implement TQM by making and implementing the pillar of it and can improve quality, satisfied the employee by providing a good approach in creation of QM environment, introduction of employees to TQM, encouraging cooperation and teamwork, customer focused product and process design and finally selection of right raw materials for production. Analyzing the product quality and process by using the TQM tools can give a remarkable improvement by reducing defect and rework.

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