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Application of Six Sigma Practice for Quality Improvement in Textile Industry

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Abstract : This article presents a quality improvement study applied at a textile manufacturing industry, for the effective and efficient management to handle and have a good internal climate inside the textile industry. The study also intends to find out additional features and service that would be added to the textile industry to make it more profitable using six sigma tools. By identifying areas of inefficiency and acting on performance barriers in textile industry a detailed report has been made to gain a fresh and different perspective to arrange to purchase the supply of Quality ginned cotton and other manmade fibres for the requirements at competitive rate. It also Survey the areas of dissatisfaction to facilitate management in the creation of greater efficiency. Conclusions were drawn from the data, and recommendations were made to the management team of the textile industry for eliminating defects in process from manufacturing to transactional and product to service. Also detail suggestions were made for increasing the operational efficiency of the spinning mills.
Keywords : Textile Industry, Inefficiency, Survey analysis, Defects, Manufacturing.

1. Introduction.

KKV spinning mills has established with an aim to undertake the purchase and supply of quality ginned cotton and other manmade fibres for the requirements at competitive rate in an international market. But due to poor quality of cotton bales, the company has to face loss and hence implemented a thorough study using six sigma tools. It has three major units such as spinning unit, warping & sizing unit, and weaving unit. With this information, the company set up team in order to improve the product quality on cotton bales. Six Sigma is a revolutionary concept when it first emerged in 1980s.It took a while before it caught on, like any other revolutionary concept. Gradually it has become one of the top concept by which companies were able to achieve productivity, profitability, quality and efficiency while improving customer satisfaction, which leads to increased sales and revenue for the company. This project is started by collecting the data and the factual condition of the textile industry with the help of six sigma practice for quality improvement.

2. Literature Review of Six-Sigma

Six-Sigma concept is developed by Motorola Inc. in the USA in about 1985. At the time, they were facing the threat of Japanese competition in the electronics industry and want to make a radical improvement in

the quality levels [1-3]. Effective principals and activities of Six Sigma are successful through the constant improvement and sequence of organizational culture. [4-6]. Six Sigma has become a business model, a symbol of excellence, with the goal of removing waste and demonstrated its power in changing organization culture and employee vision over the changes which occur within organization[7-11].The strict investigation is appropriated to spot and eliminate the important parameters that have effect on the potency through a scientific approach particularly Six sigma DMAIC (Define, Measure, Analyze, Improve, and Control) phases Cultural changes before incorporation in organizations would like enough time and sense of responsibility[12]. The effort and issue will increase because the method sigma increases[13].Ultimately, the come on investment for the advance effort and therefore the strategic importance of the method can verify whether or not the method ought to be improved or not. Six sigma is associate degree organized and systematic methodology for strategic method improvement [14-17] and it depends on applied math ways and therefore the scientific tools to form dramatic reductions in client outlined defect rates [17-19].

2. Six Sigma Dmaic Approach

The methodology used in this study is DMAIC. As this is an experimental study, it involves the data collection before & after the implementation of the corrective measures. It has five phases.

2.1 Define Phase: [DMAIC] In the Define step, a Six-sigma team refined its problem statement ie., identifies the factors which are critical to quality.

2.2 Measure Phase: [DMAIC] Measurement process was done as per the Phases predesigned in the brainstorming session. A proper Performa was developed for each phase to collect the suitable data with the reasons.

2.3. Analyse Phase.

After obtaining information about the defected unit and its sigma level, the next phase is to analyze the root of cause of the defective unit as shown in fig. 1.In analyse phase 5 whys tools were used to improve the process and to reveal the root cause of the situation. The

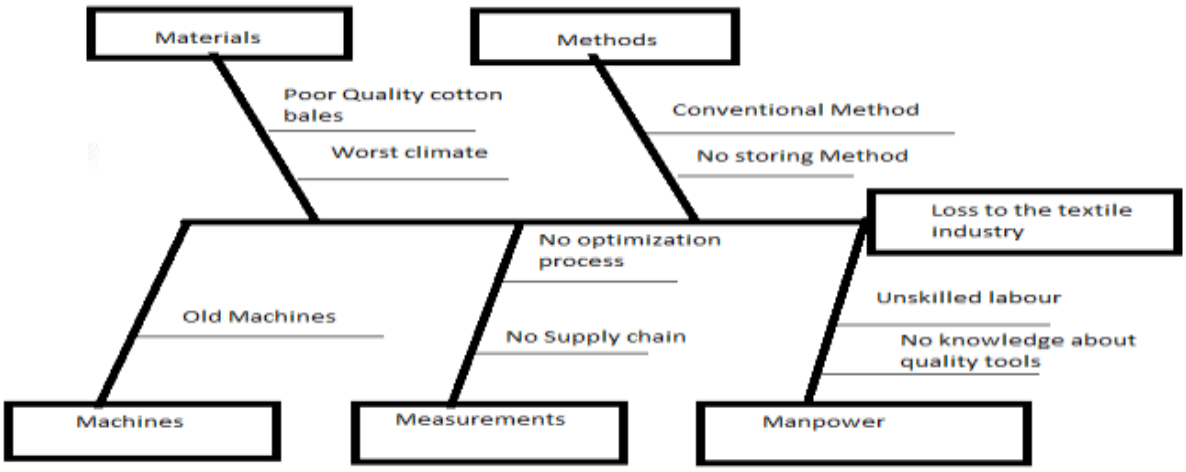

Fig.1. Cause and Effect Diagram

Table1 shows the 5 why's technique used to analyse the poor quality of the cotton bales because of which loss occurred to the textile industry.

Table 1: 5 whys: poor quality of cotton bales

S.No.	Why	Answer
Why#1	Why is poor quality of cotton bales	1.Worst Weather conditions 2. Cotton bales were purchased in unapproved places.
Why#2	Why it is not taken preventive measures against the Weather.	Not having enough storage place and lack of technique.
Why#3	Why is cotton bales purchased in unapproved places	Due to unavailability of cotton bales in approved places.
Why#4	Why it is not available.	During peak time cotton bales were purchased in approved places and stored in a well planned storage place by other spinning mills which follow supply chain and six sigma quality tools.
Why#5	Why the quality tools were not used	Unaware of benefit of quality tools and not attended the training and hence faced the losses.

Consequently, the brainstorming sessions is conducted to identify the major problem that makes an impact on the profit of the textile industry and quality of the cotton. It is clear that, the cotton bales were purchased from the unapproved places and has to face the poor quality. Subsequently, various solutions were identified through brainstorming namely, introduction of 5S methodology in the premises, Procurement of cotton bales during peak season and store at well planned area so as to avoid damages due to contaminations by humidity and pests.

2.4. Improvement Phase:

In improve phase, the brainstorming session is retrieved with the stakeholders discussing the current status of the system. After vicious investigation, the consensus is made that, the idea of rectifying root causes found from the 5 whys techniques to purchase and supply of Quality ginned cotton and other manmade fibres for the requirements at competitive rate and enhances the effectiveness and efficiency of the textile industry. The following lists of works have also been done in the improvement phase.

- Establishment of reliable maintenance management software.
- Optimization of Process of preventive maintenance.
- Make a maintenance schedule in collaboration with production planning.
- The availability of instrumentation and tools.
- Institute Training of personal towards quality.

Various suggestions for improvements were given. Some of the major ones were:

1. Proper Training is imparted to the Quality Inspector
2. Quality Awareness Program is conducted for Operators and Checkers
3. A suitable Quality Manual is prepared for the unit
4. Work Instructions were developed and issued to each of the departments
5. "Quality Defects Identifiable Boards" were put up across the departments

- Introduction of Quality Checking Systems or Formats and constant observance by a trained Quality Inspector has caused forceful reduction in quality defects level.
- There may be a important decrease in Defects Per Million Opportunities (DPMO) in each Jacquard (65.5% reduction) seat covers before and once quality system implementation.
- The method sigma level has conjointly improved for each the merchandise varieties.
  In proportion terms, there's a jump in method sigma level by twenty two.48% in Jacquard product.
- Estimated inflated sale in Jacquard is Rs. 5, 31,028/- per month.

It may be with competence explicit that this sort of a modification is obvious solely once establishing foolproof measures to ascertain quality and by making its awareness among the center management, employees and checkers.

Fig.2.After implementation of 5S.

2.5. Control Phase:

In control phase, the profits have been achieved by the team personnel through refined steps. At this phase various supervisory activities were designed for all the team members and the commitment of the top management is also involved. In control phase, monitoring the implementation schedules step by step and performance comparison between before and after process is implemented using six sigma methods.

3. Results and Discussion

Six sigma DMAIC methodologies were utilized in this case study to boost the efficiency of the textile trade operation. Additionally to rearrange to buy and provide of quality ginned cotton and alternative manmade fibres for the wants at competitive rate. Following steps were taken to recommend measures for increasing the operational efficiency of the Spinning Mills.

In measure phase, severity of the problem is found in the procurement of cotton bales. In analyze phase, various parameters were analysed to improve the effectiveness of the cotton bales through 5 whys method. In improving phase, the performance comparison is listed in Table 2. It shows the performance comparison before and after implementation of DMAIC approach.

Six sigma DMAIC methodologies were used during this case study to spice up the efficiency of the textile trade operation. To boot to arrange to shop for and supply of quality ginned cotton and various manmade fibres for the needs at competitive rate. Following steps were taken to suggest measures for increasing the operational efficiency of the spinning mill.

In live phase, severity of the matter is found within the procurance of cotton bales. In analyze phase, varied parameters were analysed to enhance the effectiveness of the cotton bales through five whys technique. In up part, the performance comparison is listed in Table a pair of. It shows the performance comparison before and once implementation of DMAIC approach.

Table 2: Before and After Process

Before and After DMAIC Process:			
Step	**Before**	**After**	**Remarks**
1	Had to purchase the cotton bales in un approved places	Raw cotton was selected from TMC approved ginning units in order to ensure fineness of fibers.	Able to avoid shortages during demand. Saved Rs 1cr (934 Bales-Approx)
2	Cotton bales were not procured during peak time thereby scarcity during demand also precautionary steps were not taken to avoid damages.	Purchasedcotton ales throughout high season of convenience and hold on in well equipped and spacious space of 10,000 sq.ft with preventative procedures thus on consi der damages and loss because of contaminations with humidness and pests.	Able to avoid damages due to contaminations by humidity and pests
3	Procured cottons were not processed through well aerated Blow-Room.	Procured cotton bales were cleaned in well aerated Blow-Room by eliminating contaminations in cotton.	Poor quality thereby rejection is avoided.
4	Infrastructural arrangements were not done for carding, drawing, combing, roving and spinning	With the expertise and contemporary machineries coupled with well coordinated infrastructural arrangements, carding, drawing, combing, roving and spinning of cotton were furnished with perfection.	Timely supply and fine quality is achieved.
5.	No methods were followed for effective utilization of space and removal of waste in textile industry	**5S methodology is adopted.** **Seiri** Removed unnecessary items and disposed them properly.Made work easier by eliminating obstacles Prevented accumulation of unnecessary items.Evaluated necessary items with regard to cost or other factors.Removed all parts not in use.Segregated unwanted material from the workplace. Defined a red-tagged area to keep those unnecessary items. **Seiton** Arranged all necessary items so that they can be easily selected for the use. It is easy to find and pick up necessary items **Seiso** Cleaned workplace completely Kept workplace safe and easy to work Kept work place clean and pleasing to work in **Seiketsu(*Standardize)*** Maintained high standards at workplace at all times.Maintained orderliness and maintained everything in order and according to its standard. Everything in its right place.	Prevented loss and waste of time. Reduced chance of being disturbed with unnecessary items. Made workflow smooth and easy. Waste Removal is done. Ensured first-come-first-served basis Prevented machinery and equipment from deterioration. Standardized the best practices in the work area. Every process has a standard.

		Shitsuke(*Sustain*) Performed all the above activities regularly and audits have been done. Instituted Training and Discipline.	

4. Conclusion:

It is important to improve the efficiency of the textiles industry through the reduction of wastes and effective usage of space and cotton bales were achieved through six sigma process. Six Sigma DMAIC methodologies were implemented in the textiles industry to reduce the procurement cost of cotton bales and achieved the monetary savings. This methodology might surely help other textiles industry to gain financial benefit as much as possible. Six Sigma, however, has its strengths in more complex situations where the relationship between causes and the problem may be unknown and where more profound data analysis is required to identify the true causes of variation.

Six sigma to spot and validate root causes from an enormous quantity of data and liver the proper information to create higher business selections supported facts instead of feel.It has to include all the resources and services within the only manner and be sustained till the continual improvement is inculcated within the force. Also the followings changes are done to eliminate wastes and improve the standard of product once DMAIC in textile business.

- Established well planned storage places for storing the cotton bales.
- Required amount of cotton bales were purchased during peak time and stored under new techniques.
- Initiated the quality training workshop for the stake holders.
- Implemented 5s methodology in the industry and reduced the wastes and utility area.

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