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IMPLEMENTATION OF DMAIC APPROACH TO MINIMIZE THE DEFECTS RATE OF PRODUCT IN TEXTILE PLANT

[1]Jitender Kumar, [2]Mukesh Verma, [3]Atul Aggarwal
[1]M.Tech Scholar, SSIET, Dera Bassi
[2,3] Associate Prof., ME Deptt. SSIET , Dera Bassi

[1]erjitender11@gmail.com, [2]vermamukesh19@gmail.com, [3]atulengineer74@gmail.com

Abstract: The paper is related to Yarn Manufacturing Process from the waste clothes pieces in Textile Industry. This process has large departments here the cotton passes in different process and may be effects the quality of yarn when it reaches the package form. A thousand defects opportunities creates in the final package of yarn. That's why it is decided to do the work and implement DMAIC methodology in winding departments where the final package of yarn is make. The present study deals with elimination of winding defects in a textile industry. DMAIC approach is justified when root cause of defect is not traceable.

Key Words: DMAC, Six Sigma, Winding, Process Capability

I. INTRODUCTION

The DMAIC is a financial improvement strategy for an organization and now a days it is being used in many industries. Basically it is a quality improving process of final product by reducing the defects; minimize the variation and improve capability in the manufacturing process. The objective of DMAIC is to increase the profit margin, improve financial condition through minimizing the defects rate of product. It increases the customer satisfaction, retention and produces the best class product from the best process performance.

II. LITERATURE REVIEW

Motorola was the first organisation to use the term DMAIC in the 1980s as part of its quality performance measurement and improvement program. Recent DMAIC success stories, primarily from the likes of General Electric, Sony, Allied Signal, and Motorola, have propagated the use of quality tools for gaining the knowledge. Some of the pioneering companies, which use DMAIC methodology, are ABB, General Electric (GE), Allied Signal and Texas Instruments. General Electric spent 500 million dollar on DMAIC works in 1995 and gained more than 2 billion dollar from that investment. In 2001 Horel shows that the Six Sigma improvement methodology has received considerable attention recently, not only in the statistical and quality literature, but also within general business literature. In published discussions, terms such as "Black Belt"(BB), "Master Black Belt," and "Green Belt" have frequently been used indiscriminately, without any operational definitions provided. Ponce in 2004 shows that six-sigma knowledge characteristics, and their impact on performance and gains, have not yet been addressed regardless of its knowledge content. [9] in 2005 Kundi studied the implementation of Six Sigma in the UK organizations. Sokovic in 2006 explained that Six sigma is an effective way to find out where are the greatest process needs and which are the softest points of the process. Also, Six sigma provide measurable indicators and adequate data for analytical analysis. Systematic application of Six Sigma DMAIC tools and methodology within an automotive parts production results with several achievements. Reduced tool expenses for 40 %, Reduced costs of poor quality (CORQ) for 55 %, and reduced labours expenses for 59 %. Also, the significant results are achieved by two indexes that are not dependent on the volume of production: Production time reduction for 38 %, and Index cost/volume reduction for 31 %. Generally, improvements through reduced Production time, Control time, Material and Internal scrap will give annual benefits of $ 72 000. Expected annual benefits of external clamping system application is $100 000.[4].In 2009 Naidu implement the DMAIC in garment

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industry. The focus was exporting the final product to European countries. It was operating at a percentage defective of 4.42. After implementing the DMAIC methodology the percentage defective is reduced to 1.95. [1]

III. PROBLEM FORMULATION

In all processes the smallest variation in quality of raw material, production conditions, operator behavior and other factors can result in a cumulative variation (defects) in the quality of the finished product. DMAIC approach aims to eliminate these variations and to establish practices resulting in a consistently high quality product. Therefore, a crucial part of DMAIC work is to define and measure variation with the intent of discovering its causes and to develop efficient operational means to control and reduce the variation.

DEFECT %	0.11	0.03	0.10	1.06	0.32
SIGMA LEVEL	4.64	4.93	4.59	3.8	4.91

The expected outcomes of DMAIC efforts are faster and more robust product development, more efficient and capable manufacturing processes, and more confident overall business performance.

IV. METHODOLOGY

DMAIC APPROACH

WINDING SECTION

Last section of yarn manufacturing process where auto cone machines are installed and take an input material from combing process in the form of Lap. Then the lap is converted into thread. It gives yarn on paper cone after passing detecting instrument as a output. The yarn which is obtained from winding section is able to sell the customers. So DMAIC approach is implemented to the winding section.

D- DEFINE: The definition of the problem is the first and the most important step of any DMAIC project because a good understanding of the problem makes the job much easier. The problem found is rejection due to defects in winding process.

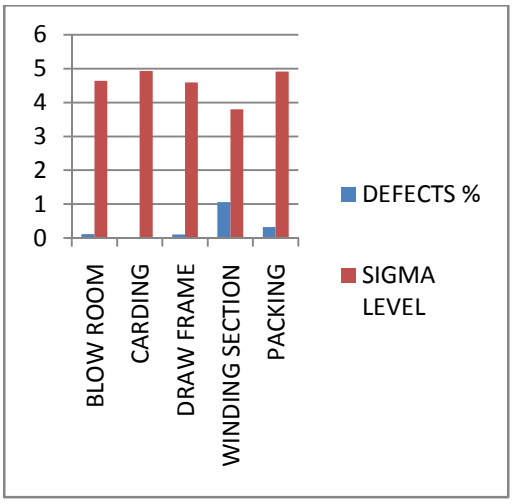

Fig. 1 Chart between Defect and Sigma Level

M-MEASURE : Measure the performance of the process by collecting the data and also write down the importance of different critical defects regarding to customer value. Techniques used are :

- Cause and Effect Analysis
- Data Collection Plan
- MSA
- Process Capability

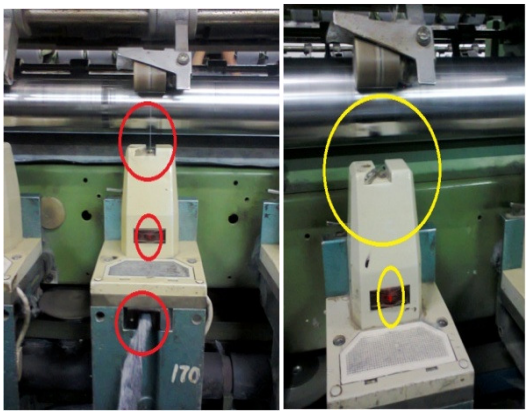

Fig. 2. Defects in Winding Section

ANALYSIS: Analyse the root causes of the process whether it can be improved or redesigned the process. There are different parameters involve in this phase which are given below.

- Process Analysis
- Regression analysis

CRITICAL SUCCESS FACTORS

STRENGTH OF YARN

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Strength of yarn depends on twist of yarn, as the twist increases the strength is also increases up to a certain limit.

CV OF YARN

CV of yarn is the variation of different parameters like, strength, count etc. and profitability of the plant. Evening shift has more defects as compared to morning and night shift. The night shift has minimum defects during manufacturing process.

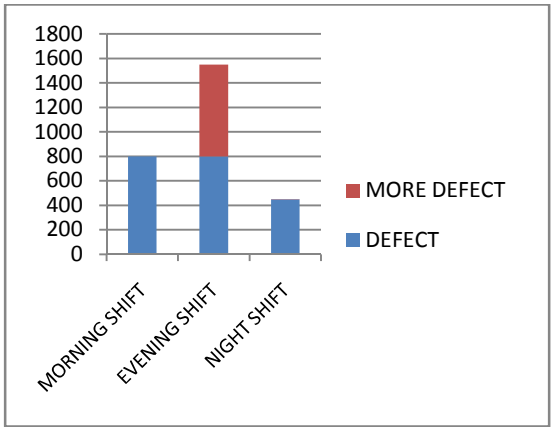

Fig. 3. Shift Wise Defect Chart

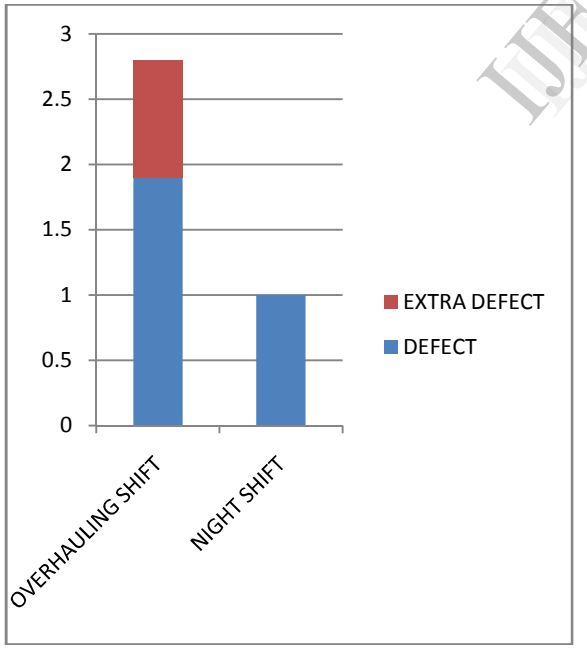

Fig. 4. Defect Cross % in Overhauling Shift

By deeply analyzing this problem, whenever change the product at machine or run the machine after overhauling chances of Stitch defects increases in first shift. Up till second shift things get normalized.

All overhauling is done mostly in morning shift by the maintenance team and restart the machine in evening shift .

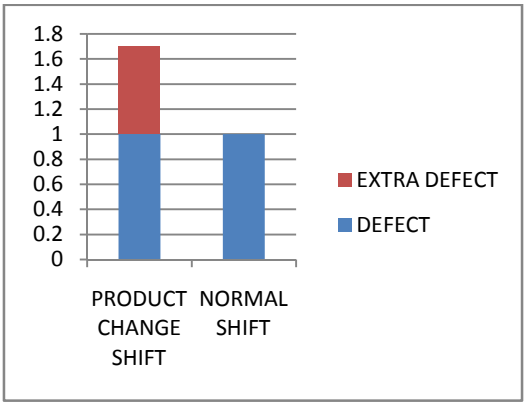

Fig.5. Defect Cross % in Product Change Shift

I-IMPROVE

The improvement of process is calculated by the help of Design of Experiment. In order to improve the process, some settings are change which are the sever effect on the defects of final product.

In this normal plot, some significant factors are shown which causes major effects on the defects on the product in the winding process.

1- Scan cuts
2- Speed of winding machine
3- Disk of machine
4- Suction mouth gauge

Parameters

- Global Solution
- Scan Cuts = 37
- Speed = 700
- Disk = 1 (Good)

  Guage = -1 (< 6mm)
- Speed is already slow so no big influence on defect.

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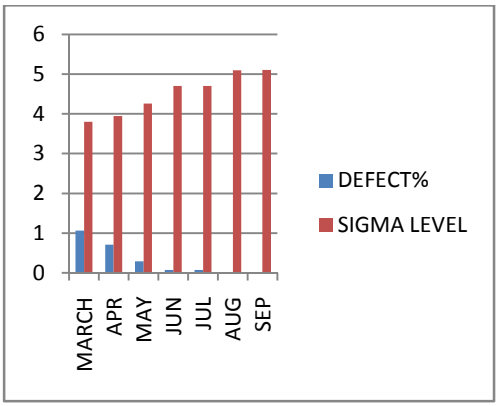

Fig. 6. Bar Chart after Improvement

- Scan-Cuts and Disk life are most important factors. They need to be controlled to achieve optimum results best Scan-Cuts are below 40.
- Condition of Disk should be good always and the suction mouth gauge should be less then 6 mm

C-CONTROL In control phase, the process will be check by applying the control charts whether it is control or not. Variation of whole process should be in control limits for control process. Statistical process control is used to monitoring the consistency of process and makes the process is under control.

Data of defects %age shows that the process is under control and there is not any point in this graph which is out of control limits.

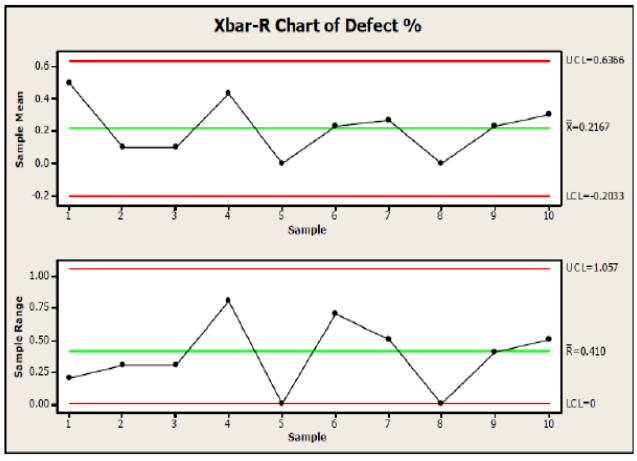

Fig. 7. X-bar –R chart of Defect %

RESULTS: The defects has been reduced from 13012 to 185. The sigma level has been increased from 3.81 to 5.10.

V. CONCLUSION

It is necessary to work in a systemic way and try to improve financial condition of the organization. I have also implemented DMAIC tool in our report to highlight the clear understanding about the problems and importance of critical success factors to the quality of final yarn product.

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