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Six Sigma Frame Work for Enhancing Quality in Garment Sector

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ABSTRACT

Six Sigma is a disciplined, statistical-based, data-driven approach and continuous improvement methodology for eliminating defects in a product, process or service Sigma represents the population standard deviation, which is a measure of the variation in a data set collected about the process. It can also be thought of as a measure of process performance, with Six Sigma being the goal, based on the defects per million. Once the current performance of the process is measured, the goal is to continually improve the sigma level striving towards 6 sigma. The core objective of this project is to reduce the total imperfections in Yarn manufacturing process by optimizing the effect of the controllable parameters involved in the Yarn manufacturing process through a disciplined Six Sigma methodology.

KEYWORDS: Six sigma, Lean, FMEA

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1. INTRODUCTION

1.1. About the Garment Industries, Lean and Six Sigma

The Indian textiles industry is extremely varied, with the hand-spun and hand-woven textiles sectors at one end of the spectrum, while the capital intensive sophisticated mills sector at the other end of the spectrum. The decentralized power looms/ hosiery and knitting sector form the largest component of the textiles sector. The close linkage of the textile industry to agriculture (for raw materials such as cotton) and the ancient culture and traditions of the country in terms of textiles make the Indian textiles sector unique in comparison to the industries of other countries. The Indian textile industry has the capacity to produce a wide variety of products suitable to different market segments, both within India and across the world. Six sigma is such a management tool is viewed as a systematic, scientific, statistical and smarter approach to create quality innovation and total customer satisfaction. This paper emphasizes the six sigma concepts and possible area of six sigma applications in textile industry. Historical studies have shown overall savings in the $10,000 to $20,000 range for an improvement of just one Sigma. Six Sigma is a new strategic paradigm of management innovation for company survival in this 21st century which implies three things such as statistical measurement, management strategy and quality culture.

2. LITERATURE REVIEW

Today, the performance of a company (in terms of quality, flexibility, time and cost) is the result of the aggregation of activities; the passage of a local efficiency to an overall efficiency is via a set sequence of operations and by the additivity of local performance. It depends on the organization considered a global perspective and the quality of interactions between different components. This approach is based on the systematic elimination of waste and continuous improvement of productivity. Thus, the application of the DMAIC approach to the maintenance process requires a good knowledge of the process with use of many tools based on statistical techniques and different methods of analysis of processes such as: the FMEA, design of experiments, Pareto, Hishikawa, 5S etc[1].

After conducting this research, we have found that: Current sigma level of the production was 4.91 sigma with DPMO level at 200 units. The dominant defect type was side flat that was triggered by speeding up curring time without proper increase in the temperature. The company should increase the temperature when speeding up the curing time to avoid the side flat types. From Design of Experiment, we found that if the company need to speed up from 5 hours to 4 hours then it should increase the temperature up to 350°C. Improved sigma level was 5.02 sigma with DPMO level at 180 units. This result may not be significant because it did not met required 6 sigma, therefore, the company should continuously improve its process[2].

In their work an initiative has been taken to apply six-sigma in auto sector manufacturing firm to reduce the level of defects and further they made an attempt to initially apply define phase and with the help of six-sigma also with quality management they improvised the productivity and quality at higher level and achieved customer delight[3].

The development of this study was aimed at improving the extrusion process, with the purpose of reducing the non-conforming (work-off) material generated. This objective was reached through the use of Six Sigma methodology, as well as its associated tools, which allowed for the identification and efficient intervention in problems such as excessive rejected material during setup and feed failures on the extruders. In this sense, the use of Six Sigma methodology played a decisive role in the achievement of the proposed goal, ensuring that there was a systematic and disciplined approach to the issues at hand through the DMAIC cycle. This provided the necessary support to the organization, so that it was able to produce more quickly, more economically and with greater quality[4].

In this paper, the objective is to help the people in the SMEs, to implement six sigma project in their enterprises and reduce the cost of six sigma implementation. For this, we have proposed a six sigma framework describing the fundamental elements of the six sigma methodology and the relationships between them. A list of requirements for the verification of the results obtained at the end of each phase is provided. Objective and requirements diagrams have been designed starting from the meta-model to provide a guide to a six sigma users to achieve requirements satisfaction. To validate the feasibility of our proposition, it will be necessary, in a near future, to put our meta-model as the core of an expert system helping small and medium enterprises to support their six sigma projects development saving the high costs linked to six sigma experts evaluating the results obtained during each phase[5].

Based on the research, it can be summarized as follows: From the production activity, non value added activity (NVA) consists of 33.67% and non necessary non value added activity (NNVA) consist of 14.20%. The production of drying iron ore is not optimal due to production efficiency only at the level of 52%.The most common and influential waste are inappropriate processing and defect. The process capability is at the level of 2,96 sigma. The proposed improvement program is develop to overcome the problems that consist of redesigning chute dust collector, weighing standard operation procedures, BC 05 erection, vibrometer installation and nitrogen plant installation[6].

3. METHODOLOGY

Table 1: Data Collected for 5 days –As Is

Date/Process		Mixing	BP	V.fan	V.Beater	U.Fan	U.Even.Roller	U.Beater	F.Fan	F.Beater
Day 1	9am	159	220	213	251	293	366	393	483	499
	3pm	155	215	211	250	291	345	386	452	475
Day 2	9am	160	219	215	247	287	340	380	461	486
	3pm	150	210	208	240	277	335	375	452	470
Day 3	9am	163	225	214	255	295	375	399	485	501
	3pm	150	211	209	241	278	333	373	450	465
Day 4	9am	158	222	214	248	296	350	375	448	459
	3pm	151	205	201	235	280	339	359	435	450
Day 5	9am	154	213	208	240	281	340	360	440	455
	3pm	152	209	199	215	256	305	335	398	421

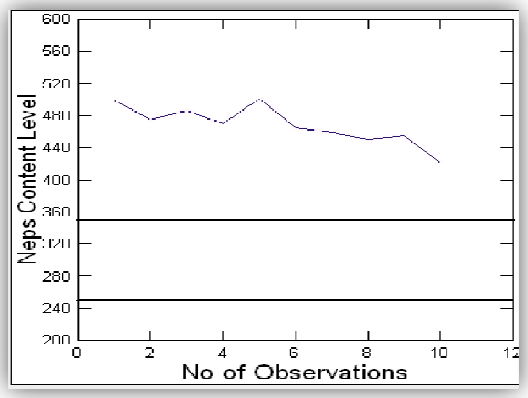

Fig 1: X-Bar Chart

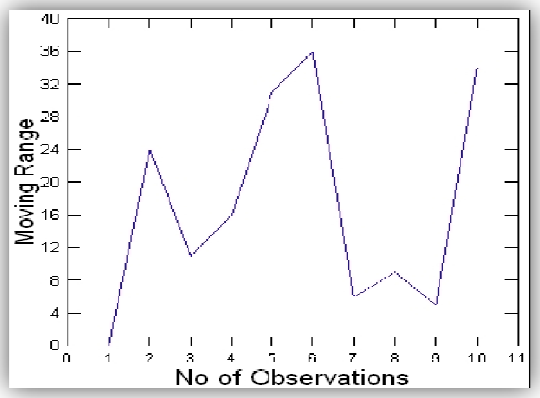

Fig 2: Moving Range Chart (R Chart)

3.1 Analyze phase:

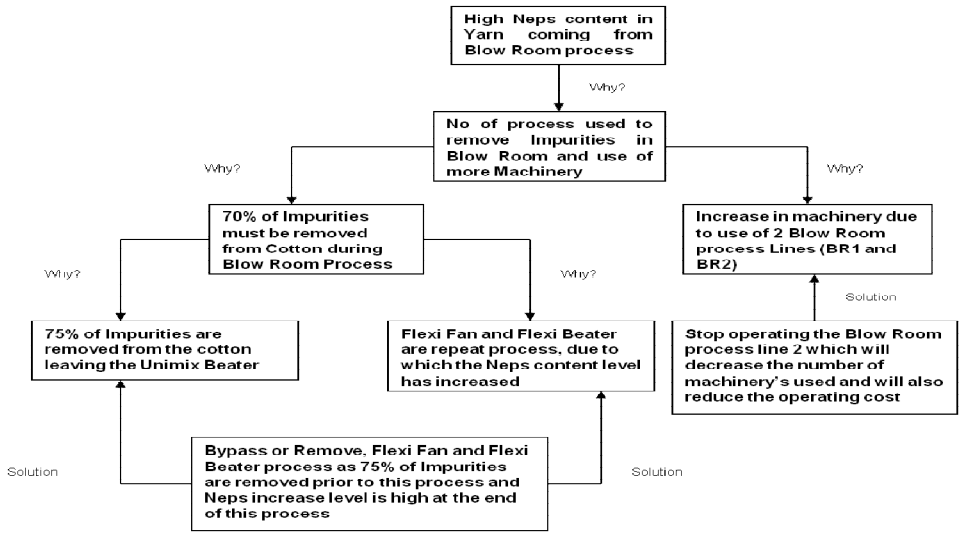

Fig 3: Root Cause Analysis

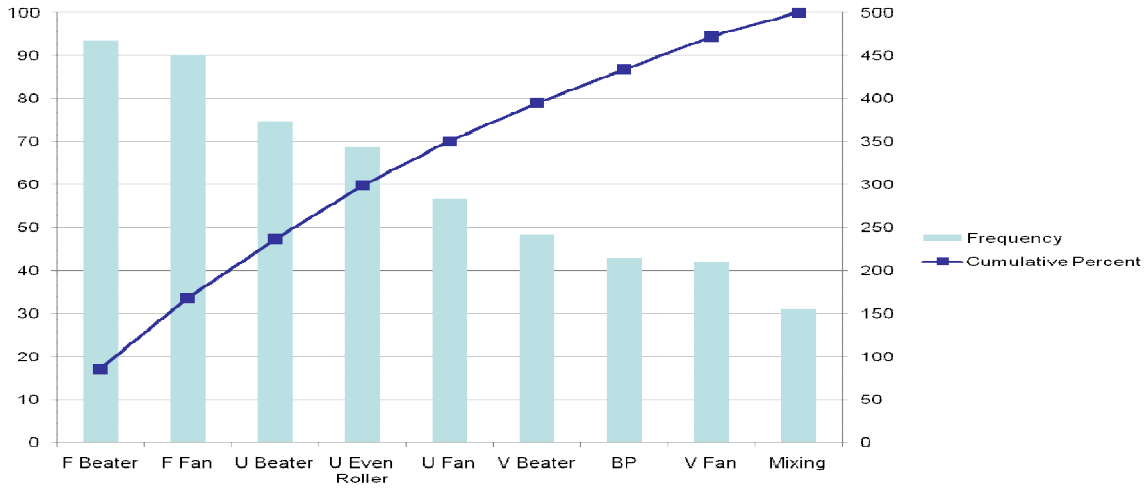

Fig 4: Pareto Chart

3.2 Improve Phase:

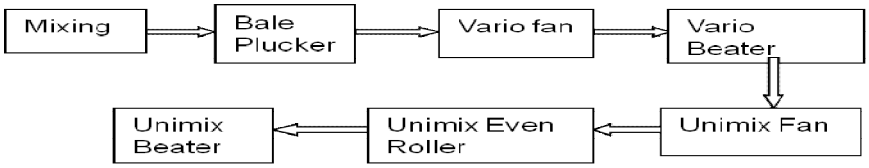

Fig 5: Improved Blow Room Process

Table 2: Data Collected for 5 days –To Be

Date/Process		Mixing	Bale Plucker	Vario fan	Vario Beater	Unimix Fan	Unimix Even Roller	Unimix Output
Day 1	9am	165	213	202	239	284	256	299
	3pm	160	215	198	235	275	250	287
Day 2	9am	163	211	200	240	285	255	310
	3pm	159	201	196	230	270	245	280
Day 3	9am	166	215	210	249	285	267	305
	3pm	161	218	209	250	279	270	315
Day 4	9am	165	212	200	230	280	260	307
	3pm	162	210	198	240	277	265	295
Day 5	9am	168	216	205	260	289	275	322
	3pm	164	213	203	249	283	250	312

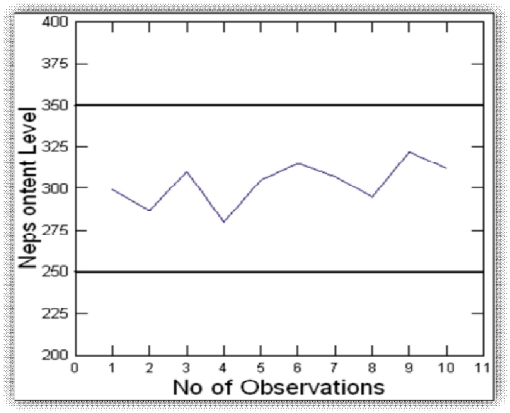

Fig 6: X-Bar Chart

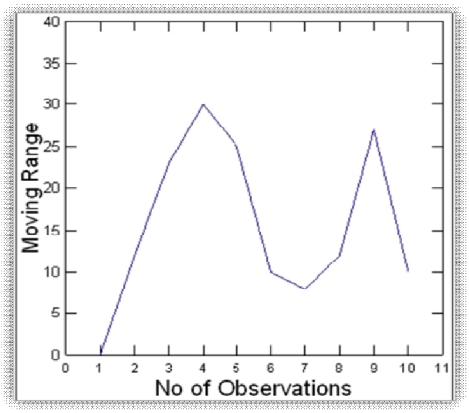

Fig 7: Moving Range Chart (R Chart)

3.3 Control Phase:

Standard Operating Procedures (are being prepared which will ensure that correct process conditions are employed all the time.One point lessons will be implemented wherever required.SOP's will include necessary safety precautions and also correct work methods. Quality testing plan will be prepared for raw cotton neps, process stage wise neps and BR delivery neps and final yarn.X bar Control chart will be used in appropriate places to identify if there are deviations.Mistake proofing will be done in some of the keys areas like electronic settings etc with user name and passwords.

Table 3: FMEA Chart for Blow Room Process

Process Step/ Input	RPN 'as it is' process	Actions Recommeded	Responsibility	Action Taken	SEV	OCC	DET	RPN Improved process
Mixing	175	Bale layout Needed	RM	Implemented	7	2	2	28
Mixing	50	Bale layout Needed	RM	Implemented	7	2	2	28
Blow Room	320	Control panel to be set with password	Electrical	Implemented	5	1	1	5
Blow Room	512	Control panel to be set with password	Electrical	Implemented	8	1	1	8
Blow Room	512	Control panel to be set with password	Electrical	Implemented	8	1	1	8
Blow Room	729	Limit switch to be provided, machine not to work otherwise	Maintenance	Implemented	9	3	3	81
Blow Room	150	Inspection and preventive schedule to be followed	Maintenance	Implemented	6	2	2	24

4. ANALYSIS AND RESULTS

Identified two Blow room are not required and one Blow room line can take care of the requirements. In the identified line, Flexi Clean machine has been identified as over processing machinery and eliminated. Improvement is achieved to about Rs 12 Millions saving every year. Required quality of final yarn is achieved and business risk is mitigated.

5. CONCLUSION

DMAIC approach aims to achieve maximum customer satisfaction and minimizing the defects. It targets the customer delight and new innovative ways to exceed the customer expectations. Able to identify a significant improvement in process capability and sigma level.This approach can be further used until 6 sigma is attained in the process.

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