

Reduction In Rework And Rejection Through The Application of Six Sigma

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Abstract— This article discuss about the implementation of six sigma methodology in reducing rejection and rework in machine manufacturing process where the six sigma DMAIC approach has been used to achieve the result .this article explains the step by step approach of six sigma implementation in a manufacturing process for improving quality level in product the company manufactures aluminum tube where its receiving high wastage rejection of product so during this study data were collected on all machining process were we used to analyses the data and identify defective wastage in tube in percentage which can be calculated through by the total no of defects of tubes to the ratio of total no of units in tubes and conclusions were made by using this method. Reduction of defects at tubes in internal wastage rejection machine which is current 8.41% so to reduce minimum rejection percentage in at 8 month up to at 5.50%

Keywords— Six Sigma methodology, DMAIC,

I. INTRODUCTION

Almin extrusion Pvt Ltd is the manufacturing industrial company which is established in the year 1980 An ISO 9001:2008 certified company where they are manufacturing and supplying a comprehensive range of superior grade aluminium collapsible tubes. These tubes are widely used for packaging pharmaceutical products such as in eye ointment product. These tubes made according to their customer specification in this according to their work how much internal rejection occurring in various different machines at in Extrusion press, Trimming, Annealing, Lacquer, Coating, Printing, Latex and Capping were we found that internal rejection at tubes highly occur in printing machine so that in this project to identify how much internal rejection occurs in printing machine and according to that how much rework of tubes can be possible in printing machine so here by applying DMAIC methodology reduction in rework at tubes can be done. In this segment there are many other suppliers therefore the quality of the product has been one of the company's key success factors. In order to remain its competitiveness in the industry tube set its strategic initiative to improve its product .therefore the company has reviewed the customer feedback related to its product quality. From customer perspective the company has issues in upper surface of an printing tubes sometimes they found misprinting on the tubes especially in printing machine .By this information ,the company set up team in order to improve the product quality on printing tube in machine. This project was begun by collecting data and factual condition of the production. During production period of June 2018 printing tube has the most defected units covering approx. 6% rejection which is reported by the department

II. LITERATURE REVIEW

S.Muthu et al. [1] applied Reduction of paint line defects in shock absorber through six sigma DMAIC phases here pare

to chart, voice of business and project charter were used for analysis. The main objective to identified to find out the root causes that eliminates the variations and embarks the customer satisfaction, quality and market share of the shock absorber manufacturing process ,the various phases of these papers to identify peel off and blisters were the two fold responses that impact the quality in the pretreatment process .here the enhances sigma level reaches from 3.31 to 4.5 .now here sigma level reach 3.4 DPMO by continuously improving on the optical parametric combination that eliminates the peel off and blisters defect and embodies the pretreatment stage by generating the process control plan in shock absorber manufacturing process.

Srinivasan K. et al. [2], applied DMAIC methodology to improve the effectiveness of shell and tube heat exchanger of a furnace in a small sized furnace company. Pareto chart, cause and effect diagram brainstorming sessions were used. They identified that less heat transfer area is the reason for less effectiveness. Heat transfer area was increased by using circular fins. Effectiveness of heat exchanger enhanced from 0.61 to 0.664. Sigma level improves from 1.34 to 2.01 and monetary gain was Rs 0.34 million per year.

T.costa et al. [3] improved the extrusion process in tire production by using six sigma DMAIC methodology. The main objective to developed at a tire manufacturing company with the purpose of improving the rubber extrusion process of two tire semi-products, the thread and the side wall by using six sigma methodology and applying the DMAIC cycle open was able to implement some improvement procedures whose resulted in a decrease of 0.89 % on the indicator of work off generated by the production system. This approach resulted in a significant financial impact (savings of over 15000 \$ per annum) on the company quality expenses.

Adrian Pugna et al. [4] used six sigma methodology to improve the assembly process in an automotive company

where pare to chart, FMEA, pokayoke work were used for analysis. In this case by applied statically thinking and DMAIC six sigma methodology in which the main objective to identify in the riveting process in which the riveting hand tool design was improved, the riveting process capability was substantially improved on short and long term here Cpk increased from 0.96 to 1.72 .sigma level short term increased from 2.9 to 5.2 also sigma level long term increased from 1.4 to 3.7. DPMO were reduced from 81000 to 108, improving the riveting process led to 40% defect reduction choosing the most suitable supplier led to 30% defect reduction.

Sri Indrawati et al. [5] improved manufacturing continuous improvement using lean six sigma which is an iron ores industry here DMAIC and FMEA work were used .the main objective to identify the wastes or nonvalue added activity in each production process. From research it is summarized that from the production activity, nonvalue added activity consist of 33.67% and non-necessary value added activity consist of 14.20%. The production of drying Iron is not optimal due to production efficiency only at the level of 52%

Jonny and Jessika Christyanti et al. [6] observed the improvement in the quality of asbestos at PT BBI using six sigma methodology here DMAIC, pareto chart and cause and effect diagram were used in this process. Here in this the main objective to found out that side flat dominant defect type due to speeding up the curing time without simanteously increasing its temperature so after they concluded they improved that at from design of experiment company need to speed up from 5 hours to 4 hours then it can be increased the temperature up to 350 degree Celsius. Improved sigma level was 5.02 with DPMA level at 180 units.

Sudi Apak et al. [7] observed in hydrogen economy and innovative six sigma applications for energy efficiency here DMAIC cycle were used for this work. This objective to shows that how hydrogen energy boost efficiency is to emphasize the importance of exploring potential future sources of reliable and competitively priced energy so after that they concluded and improved that to finally establish clean renewable energy sources which is based on hydrogen energy and minimize internal as well as external costs.

Siyu chen et al. [8] improved in the design of JMP/SAP based six sigma management system and its application in SMED. Here DMAIC cycle were used .here the main objective in implementation of six sigma management helped enterprises to improve the efficiency of manufacture and eliminate unnecessary waste

Carmen cunha et al. [9] used a DMAIC project to improve warranty billings operation in a Portuguese car dealer .here DMAIC cycle were used for this work the main objective to find out a defective part in an audit and generated with a more controlled cash flow .this case study made clears that the company currents metrics only attended financial budget concerns and were not able to establish where and why money was being lost or missing .so that we put in evidence to show that how the proposed metrics allowed to seek for improvement of the billing

process in a continuous cycle, thus turning the cash flow under tighter control and decreasing the loss of money and in parallel accomplish value of car brands.

Hikmet Erbiyik et al. [10] improved an application for an automotive subsidiary industry in bursa in turkey at six sigma implementation in supply chain here feasibility, tyre production and FMEA steps were used for this analysis. Here the main objective identified that one of that tool of that company utilize to comply with the continual improvement of the quality management is implementing in six sigma methodology. Also in order to decrease the number of defects and failures which affect the quality in supply chain process. Business performance in white goods (home appliances) sector in turkey .here SIPOC, histogram and brainstorming.

Lubica Simanova et al. [11] concluded specific proposal of the application and implementation six sigma in selected process of the furniture manufacturing .here SIPOC, Brain storming, histogram and affinity diagram were used in this analysis. The main objective to ensure greater effectiveness and efficiency of processes also to improve the quality as well as to eliminate or reduces the causes of problems. After improving here we found that the level of quality assurance and improvements of product and services is much done in the furniture manufacturing company.

Sudi Apak et al. [12] observed in hydrogen economy and innovative six sigma applications for energy efficiency here DMAIC cycle were used for this work. This objective to shows that how hydrogen energy boost efficiency is to emphasize the importance of exploring potential future sources of reliable and competitively priced energy so after that they concluded and improved that to finally establish clean renewable energy sources which is based on hydrogen energy and minimize internal as well as external costs.

B.Barbosa et al. [13] solved quality problems in tyre production, preparation process through a practical approach, DAMIC cycle, pareto analysis, structure analysis tool were used. The main objective here in order to achieve improvements in product quality rate which is increased by 41% through sig sigma

Muzaffer Erturk et al. [14] studied the effects of six sigma approach on work were used .the main objective of the project priorities is determined by contribution to business and environmental interests, the needs of the project and the source needs to be configured and flow structure of that project is defined. here in this the performance improvement contribution to the company is as follows 20-30% in the development of new technology, 40-59% in the development of new product,, 20-30% in the count of new innovations, 80- 100% in the costs, in the productivity and in the profitability, 40-59% in the employee satisfaction and 60-79% market share in turkey a conclusion that the six sigma approach had been positive impacts on the white goods company

Sahno Jevgeni et al. [15] improved in frame work continuous improvement of production processes and product through put here DMAIC and FMEA were used .here the main objective to reducing the no of failures in

the constraint facilities reduction in production lead time also on other hand it increases product throughput.

Pavol Gejdos et al. [16] improved in continuous quality improvement by statistical process control .here DMAIC cycle were used .the main objective to identify the effects of the processes that cause unnatural variability in results of error and poor quality. From research it is summarized that the combination of tools is very suitable for achieving desired objectives can help all solve tasks and problems of the quality improvement.

Chaib Rachid et al. [17] improved in contribution to the optimization of strategy of maintenance by lean six sigma .here DMAIC,SIPOC were used .the main objective to find difficulties and sources of ineffectiveness live in the choice of actions of maintenance especially when the machine plays a vital role in the process of production. From research it is summarized that elimination of waste and continuous improvement is done.

David Parryet al. [18] Improved in auto verification of clinical chemistry and immunoassay test results by using six sigma process improvement .here DMAIC cycle were used. The main objective is to summarize a project that took three clinical laboratories about 40% to 60% of tests being auto verified to more than 90% is presented in six sigma .from research it is summarized that the impact of system is verified by using lean six sigma

Isabel L Nunes et al. [19] applied integration of Ergonomics by using lean six sigma the main objective is to identify synergistic effect in CI were a new methodology were used DMAIC from research it is summarized that the model of a framework regarding the integration of ergonomics is useful in continuous improvement

Ali Erdogan et al. [20] observed in literature search consisting of the areas of six sigma usage here DMAIC cycle were used .the main objective is to identify that six sigma aims to go a right level by analyzing 3.4 defectives rate at one million productions. From research it is summarized that the enterprises which adopt the six sigma approach aim to provide service in maximum level by reducing cycle time and minimizing the errors in the processes.

R.U. Lomte et al. [21] improved in reliability improvement for TSR Machine of Banburry mixer by using plant Optimization process. here cause and effect analyses were used .the main objective is to identify the failures in machine and to improve performance indicator by using by increasing MTBF and decreasing MTTR using excellence pillar of plant optimization from research it is summarized that the average value of MTBF increased to 65.02% and MTTR decreased to 64.17%..

David Hughes et al. [22] improved in purchasing management by using the optimization of product variance. here DMAIC cycle were used .the main objective is to present a new optimized approach for product variance from the purchasing perspective from research it is summarized that supplier who produces steering systems for cars is increasing complexity in an automotive industry.

Kanesan Muthusamy et al. [23] observed critical success factors in engineering education curriculum development by using six sigma methodology here DMAIC cycle were used .the main objective is to identify that to determine the critical success factors in new educations and creativity for innovations from research it is summarized that academic institute are committed producing innovative talent graduates.

Amit Kumar Singh et al. [24] improved at quality management in auto sector in a six sigma perception here DMAIC cycle were used .the main objective is to identify achieving manufacturing excellence through better quality and productivity in the new paradigm of the industries .from research it is summarized that the auto sectors need advance strategy which can have multi directional benefits and with the help of quality management auto sector are always susceptible by large scale industries.

Monika Smetkowska et al. [25] improved six sigma DMAIC to improve the quality of the production process here DMAIC cycle is used in this work and the main objective to get improving production process, increase profitability of that company

III. RESEARCH GAP

From the review of the published work related to the application of Six Sigma approaches it is observed the Six Sigma methodologies have been applied in various manufacturing industries. Likewise some efforts are made to improve the process of maintenance in machine.. Efforts are put to implement these strategies to improve the safety management in various manufacturing industries and other areas of maintenance also. Techniques of Six Sigma are mainly reported to have been implemented to incorporate design improvements to avert the in-service failures of the products or improve the manufacturing process to avoid production defects.

IV. CONCLUSION

The following major conclusions are drawn from the review of application of Sigma methodologies to improving manufacturing and maintenance fields:

- Most work targets improvement in manufacturing machine process layout.
- Improvement in maintenance process of critical components in various tools or instruments at machine can be done.
- Techniques like six sigma can help improve in the maintenance process.

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