Design, Modification And Analysis of Various Parts Before Manufacturing By Six Sigma

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Abstract- *In modern era, the six sigma tools and techniques have been implemented in various manufacturing sector, which strive to ameliorate continuous improvement in achieving less variation, cost and high quality of end product. in this project we are going to improve the quality of products in bharat forge company in FMD III lab. In this project we are going to used different six sigma tools like kaizan, poka-yoke, flow chart, control chart, pie charts etc.*

By adapting six sigma methodology and using the DMAIC cycle (Define-Measure-Analyze-Improve-Control) one was able to implements some improvement procedures whose resulted in a decrease in errors in inward products.

Keywords- Six Sigma, DMAIC Cycle, ANSYS, Inward Quality Improvement

I. INTRODUCTION

Six Sigma seeks to improve the quality of process outputs by identifying and removing the causes of defects. Six Sigma is a set of techniques, and tools for process improvement. It was developed by Motorola in 1986. Sir Bill Smith, "the Father of six sigma" introduce this quality improvement Methodology to Motorola. A six sigma process is one in which 99.9999966% of the products manufactured are statistically expected to be free of defects (3.4 defects per million).

II. LITERATURE REVIEW

Improve the extrusion process in tire extrusion production using six sigma methodology[1]

Nowadays, market's constant changes require continuous flexibility and adaptation in the supply provided by organizations. In this context, the automotive industry represents one of the most demanding sectors due to the high levels of competition it is exposed to. Therefore, and so that these organizations are able to survive, it is crucial to seek operational excellence. This is undertaken through the constant processes improvement and continuous reduction of costs. This study was developed at a tire manufacturing company with the purpose of improving the rubber extrusion process of two tire semi-products: the tread and the sidewall. By adopting Six Sigma methodology and using the DMAIC cycle (Define-Measure-Analyze-Improve-Control), one 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 165 000€ per annum) on the company's quality expenses.

Reduction of paint line defect in shock absorber through six sigma [2]

DMAIC phases approach that highly impacts quality at customer end. The define phase rolls out the tools such as Pareto chart, voice of business (VOB) and project charter which identifies pretreatment in the spray painting process as the critical stage. The measure phase reveals the continuous assessment of spray painting process, with intense brainstorming sessions the imperative responses were culminated as peel-off and blisters. In analyzing phase, the vital root causes that impact the responses were identified as cleaning temperature, phosphate temperature and phosphate pH (power of Hydrogen) by using cause and effect diagram and Likert scaling. The improve phase concentrates on optimizing the vital root causes which impact the responses by using Taguchi robust design approach. The L27 orthogonal array (OA) had been constructed with three factors and levels,results of experimentation had been analyzed by using Analysis of Variance (ANOVA) and multivariate regression which identifies the condition of optimality on peel off and blisters in the pretreatment process. In control phase, the confirmation run with optimality conditions were conducted, the results obtained from runs are satisfied which embarks the sigma level from 3.31 to 4.5. The continuous pursue on eliminating variation in the processing stage was attained by framing a control plan to control the variation within acceptable levels in the pretreatment process

III. PROBLEM STATEMENT

Reduction in inspection work of Quality Engineer with time by analyzing various parts.

VI. OBJECTIVE

The purpose of this project is to practice a student that has been gathered before in solving problem using academic research and also to gain knowledge and skills. This project also important to train and increase the student capability to get information, research, data gathering and then solves a problem by doing the calculation. The final year project also will generate students that have capability to make a good report in thesis form or technical writing. It also can train student to create in design, fabricate and analysis a new thing.

The other thing, final year project will teach student to doing a task with independently in searching and expending the experience and knowledge. So the objectives of this project are:

- Overall Business Improvement: Six Sigma methodology focuses on business improvement. Beyond reducing the number of defects present in various inward parts by the vendor.
- Reduce Costs: Reduced costs equal increased profits. A company implementing Six Sigma principles has to look to reduce costs wherever it possibly can-without reducing quality.
- Increase End User's Satisfaction: End user satisfaction depends upon successful resolution of all Six Sigma's other objectives

V. METHODOLOGY

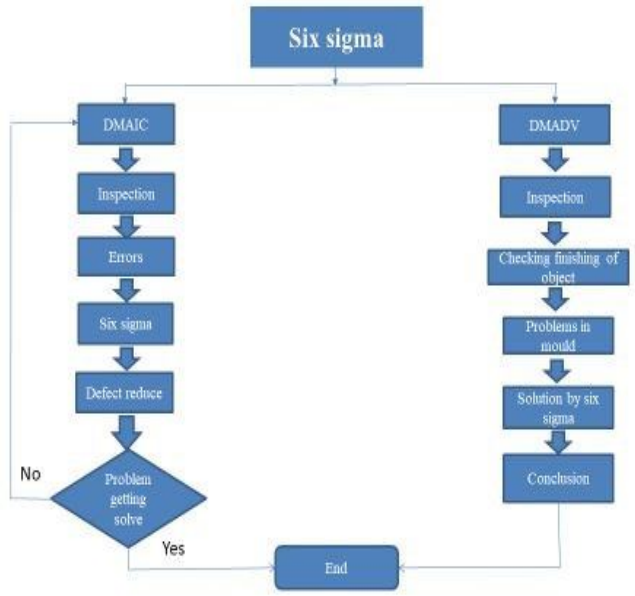

Fig. No. 1- Process Flow Chart

A process flowchart is a graphical representation of a business process through a flowchart. The above flowchart shows 2 different methods used in six sigma for improvement in quality of the product. inspection of vendor report and data analysis.In this project we are started to study about the different tools of six sigma for proper understanding of six sigma.

We are also working on the vendor rating for previous years report and we are gives the rating according to the vendor rating plan. According to that rating we are considered our five measure vendors and we are working for improve the product quality. Also we feel the data in excel sheet for easy to analyze the data

VENDOR RATING PLAN

Table No.1- Sample Vendor Rating of JS Engineering

Parameters	Rating	Quality Engg Rating	End User Rating
Rusty Material	10	10	10
Hardness Test, Material Properties	20	0	0
Deviation	70	65	60
Total	100	75	70

Table No.1 Shows the Sample of vendor rating for J.S. Engineering. In this sample, vendor got a 75 rating out off 100. Which very poor because J.S. Engineering is very important vendor for Bharat Forge. Vendor need to attach the hardness test report, material properties test report and proper drawing with material inspection sheet. This reports is very much important while inspecting job or product hence it has 20 points in rating plan.

Pie Chart for Vendor Supply

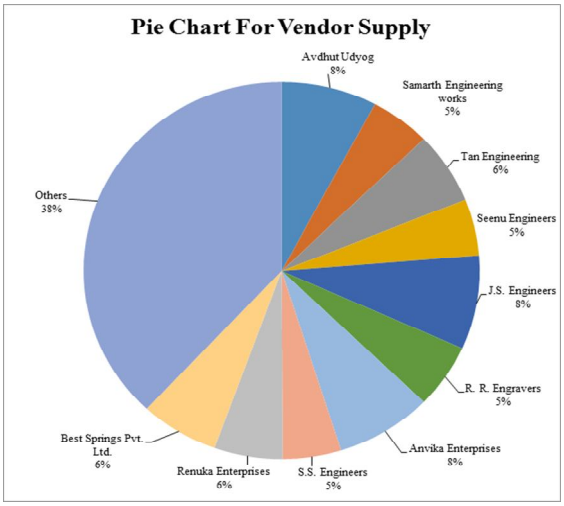

Fig. No.2.- Pie Chart

Fig No.2.-Shows pie chart with percentage of the vendor supply. From this pie chart we can easily understand the importance of the main 10 vendors.

Bar Chart of Average Ratings

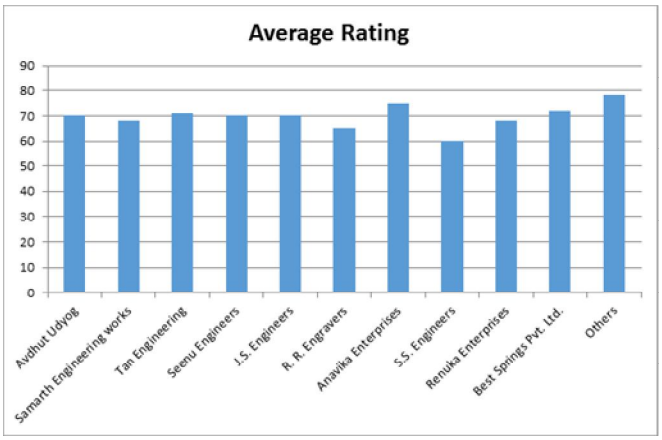

Fig.No.3. shows Bar Chart for average rating of each vendor before project start

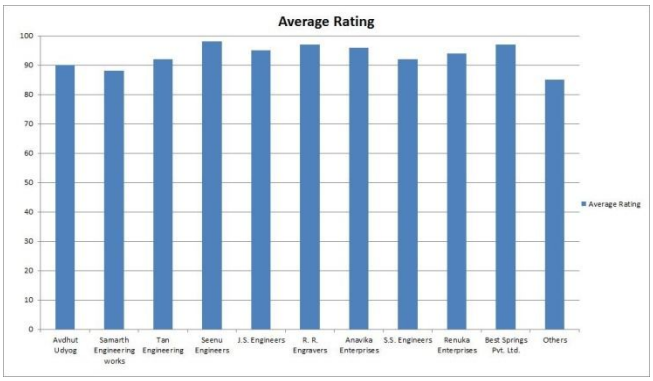

Fig. No.4 Shows Bar Chart for average rating of each vendor after improvement.

VI. CRANK SHAFT MOUNTING BRACKET

The crankshaft is a core component of today's internal combustion engine and it needs to be very accurate in manufacturing. Hence quality testing of crankshaft is very important. Quality testing of crankshaft is very important. Quality testing of crankshaft is done by using a crankshaft mounting bracket. When crankshaft is under inspection it's mounted on the crankshaft mounting bracket hence different stress are induced in bracket. Analysis of this different stress are done in the ansys software. In order to enable fatigue strength testing of crankshafts with loading that is as realistic as possible. It has developed a new crankshaft testing concept with patent pending. The new concept achieve significantly more realistic loading of test items than standard bending and torsion test methods.

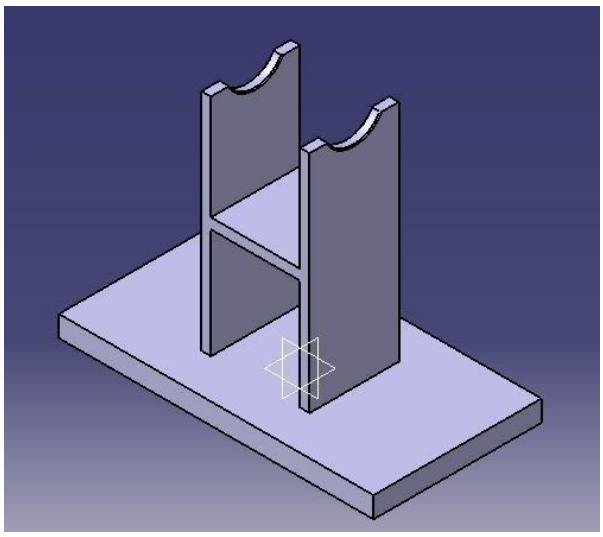

Fig 5. Crank Shaft Mounting Bracket

First,we conducted tests of crankshaft bracket.This bracket performed only two tests, then broken out the bracket. So we can design this bracket for high strength, then again

tested the crank shaft on bracket. So it performed more than five times the test.

VII. ANALYSIS

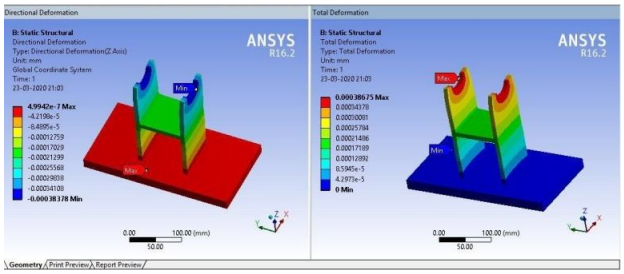

Fig .6. Total Deformation of Crank Shaft Mounting Bracket

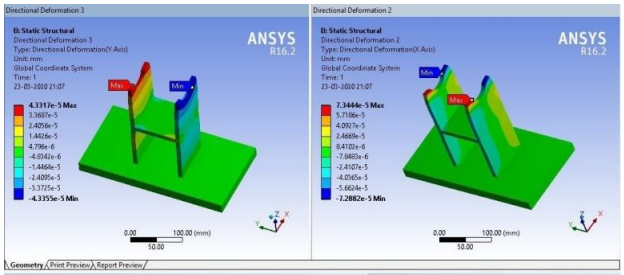

Fig 7. Information On Ordinate And Abscissa (YandX Direction

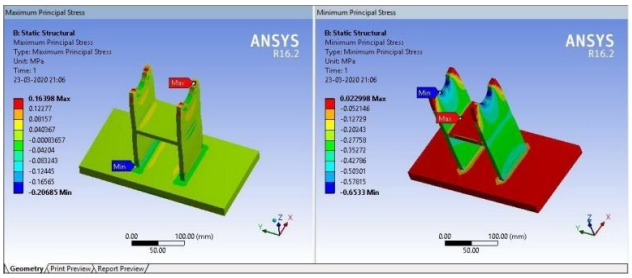

Fig 8..Maximum Principal Stress And Minimum Principal Stress On Both Axis

VIII. FUTURE SCOPE

1. 100% Quality jobs achieve from venders
2. Continues improvement Quality ,if successful, result in lower cost and more satisfied end user.
3. Improve the Quality of vender job up to 100% so that inspection time is less .
4. Continued use of six sigma technique for improvement of Quality .
5. Rejection of job should be 0% .
6. Down time should be low .

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