Quality Improvement in Small And Medium Machining Industry Through Apllication of Dmaic

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Abstract- *Six sigma is a systematic method for process improvement. It relies on statistical methods to reduce the defect rates and achieve improved quality. A case study is carried out for a medium, machining industry. DMAIC methodology along with Taguchi method is used to minimize the defects in the hydraulic cylinder part name- Head End Cover-CWMOO100G1. Based on the observation and findings, the optimized process parameters are taken for experiment and better performance obtained in the production process was confirmed. The comparison between the existing and the proposed process has been attempted in this work and the results have been discussed in detail*

Keywords- *Six Sigma, DMAIC, CNC Machining, Hydraulic Parts, SME*

I. INTRODUCTION

A-CNC Machining:

Fig. 1. CNC Milling

A Machining process is performed by employing various cutting tools to precisely gain products having specific measurements and high quality surface finish. The entire machining process includes many intermediate processes such as Drilling, Milling, Grinding, Knurling etc.

Turning could be defined as one of the most basic metal removal machining processes. Machining parameters such as the number of passes, depth of cut for each pass, feed rate and cutting speed influences the production cost, tool life and machining quality to a great extent. The proper selection of cutting parameters leads to minimum cost, longer tool life, lower cutting force and better surface roughness. Turning can be either on the outside of the cylinder or on the inside (also known as boring) to produce tubular components to various geometries.

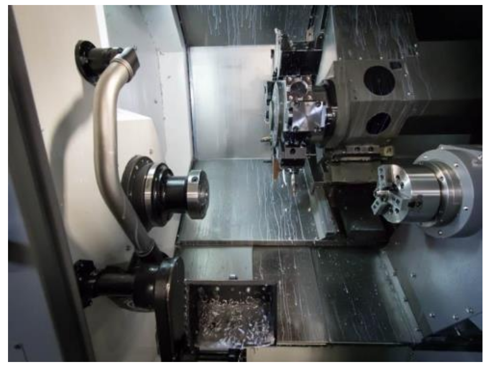

Fig. 2. CNC Turning

B-Six sigma

Sigma "σ" is the Greek alphabet letter which is used by statisticians to measure the variability in any process. It is the important set of techniques and tools for process improvement. The Greek letter sigma stands for standard deviation which measures the current process performance by using customer requirement.

The strategies of six sigma seek to improve the quality of the output of a process by identifying and removing the causes of defects and minimizing variability in manufacturing and business processes. Six sigma can be generally defined as a statistical measure of the performance of the product and the process.

Fig. 3. Six sigma

It helps to achieve best performance as well as leadership in business. It tells us how well a process performs and helps people and process to deliver best quality products without defects and best quality service.

II. RESEARCH OBJECTIVE

Background and reasons for selecting the project: Growell CNC Systems, Peenya, Bangalore is a medium machining industry with high investment machines and tools. The company has high rejections in the form of dimension variations. Reason to select this project is to improve the quality of the components by reducing the defects obtained thereby. This helps the company to sustain the market competition by improving its quality with minimum investment.

Aim of the project: To reduce the% of rejection and improve the quality of the component produced in the company.

Process flow of component

1. RM inspection.
2. Blank cutting.
3. Rough drilling.
4. Rough turning.
5. CNC 1st operation.
6. CNC 2nd operation.
7. Slot Milling.
8. Deburring.
9. Engraving.
10. Final inspection.
11. Oiling and packing.
12. Dispatch

CTQ	Measure & Specification	Defect Definition
Spigot Diameter	It is checked with micrometer	Spigot diameter is U/S as per part drawing.

III. METHODOLOGY

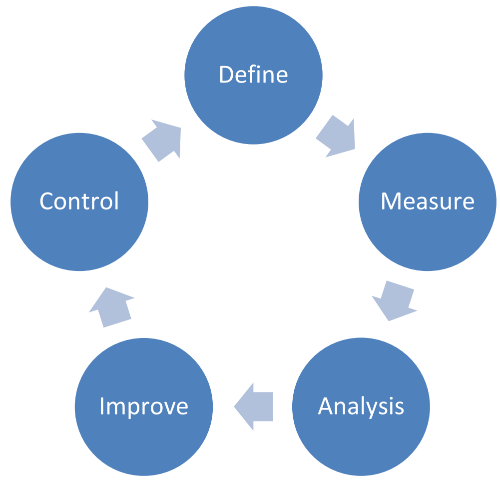

Fig. 5. DMAIC Method

After selecting the CTQ dimension; the date is collected for the year 2018.based on that the no. of defects observed are recorded and % of rejection calculated.

Year	Total parts produced	No of defects observed	Rejection in %
Jan-18	850	0	0
Feb-18	900	12	1.3
Mar-18	720	0	0
Apr-18	500	0	0
May-18	740	0	0
Jun-18	325	5	1.5
Jul-18	400	3	0.8
Aug-18	800	0	0
Sep-18	810	0	0
Oct-18	642	10	1.6
Nov-18	657	1	0.15
Dec-18	253	0	0
	7597		

Work schedule	
Define	: 02 Feb 2019
Measure	: 25 Feb 2019
Analyze	: 20 Mar 2019
Improve	: 20 Apr 2019
Control	: 15 May 2019

Defects Per Million Opportunity (DPMO): It is average number of defects per unit observed during an average production run divided by the number of opportunities to make a defects o product under study during that run normalized to one million.

Total production of Head End Cover of last year =7597
The rejection by spigot diameter undersize of the last year= 88
No of opportunities = 14

Part Name	Average Rejection in %	DPMO	Sigma level
HEC (G13)	1.15	827	3.3

IV. RESULT AND DISCUSSION

The greater the sigma level, the superior the process and lower the probability of the defect rate. It is seen from the verification of experiment results are the rejection percentage of defects of the machining process was reduced by the optimal setting of process parameters.

Description	Existing process	Proposed process
Total production	7597	150
Rejection components	88	1
% of Rejection	1.15	0.66
Sigma Level	3.8	4.0

V. CONCLUSION

After the analysis is carried out in the “Analyze” and “Improve” phases of DMAIC and statistically significant impact on the decreases the defect rate in the machining. In control phase, we could determine a most select parameter setting for reducing the Spigot-Diameter defects. The best possible parameter setting reduced the defect percentage by 3% through confirmation test. This can be finalized that make use of the six sigma approach was successful in classifying problem, improving the process, and controlling the defects.

VI. FUTURE SCOPE OF WORK

Additional investigate work can be done with a broader variety of levels and workers with dissimilar experience to reduce the defect even further. SPC charts can be used to control the processes and setup future experimentations to attain zero defects.

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