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Process Analysis of Six Sigma Concept In Bearing Industry

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ABSTRACT - A Six sigma concept is basically useful to achieve the zero defects, in all functional areas of the organization. By using of the tools of the DMAIC process, we can produce the quality product which will be the best product suitable to market made with all defined criteria of the manufacturing even with the very attractive and reasonable cost and improved quality. Six sigma concepts is very useful to the all branches, likes mechanical, electrical, electronics, etc. In short, we can achieve the 99.99 % accuracy by using six sigma concepts.

Keywords – Six sigma, Bearing, DMAIC Cycle.

INTRODUCTION

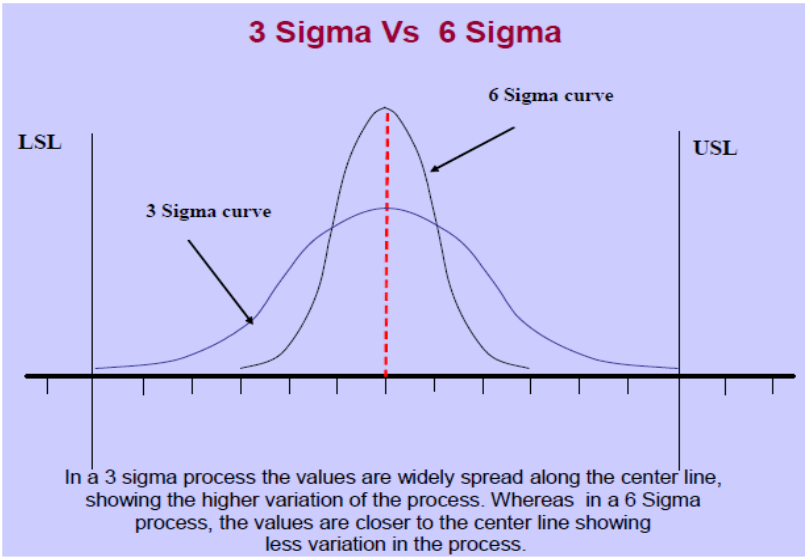
The Greek letter sigma is that mathematic term. That simply represents a measure of variation the distribution around the mean of any process. Sigma is measuring the capability of the process to perform defect free work.

Six Sigma is a business management strategy, originally developed by Motorola in 1986.Six Sigma became well known after Jack Welch made it a central focus of his business strategy at General Electric in 1995, and today it is widely used in many sectors of industry. Six Sigma seeks to improve the quality of process outputs by identifying and removing the causes of defects (errors) and minimizing variability in manufacturing and business process It uses a set of quality management methods, including statistical method, and creates a special infrastructure of people within the organization ("Black Belts", "Green Belts", etc.) who are experts in these methods. Each Six Sigma project carried out within an organization follows a defined sequence of steps and has quantified financial targets (cost reduction and/or profit increase)

The term Six Sigma originated from terminology associated with manufacturing.

Sigma	Defect par million	Yield
1	691,462	30.90%
2	3,085,380	69.10%
3	66,807	93.32%
4	66,210	99.38%
5	233	99.98%
6	3.4	100.00%

Table 1 : Sigma Level Table



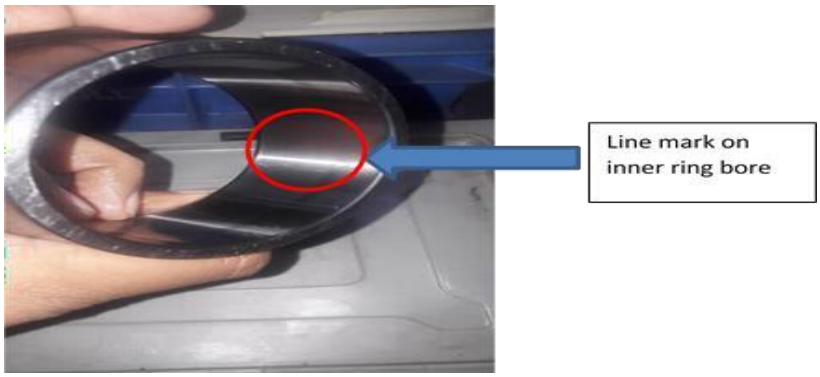
Taper Roller Bearing Cages

Spherical Roller Bearing Cage

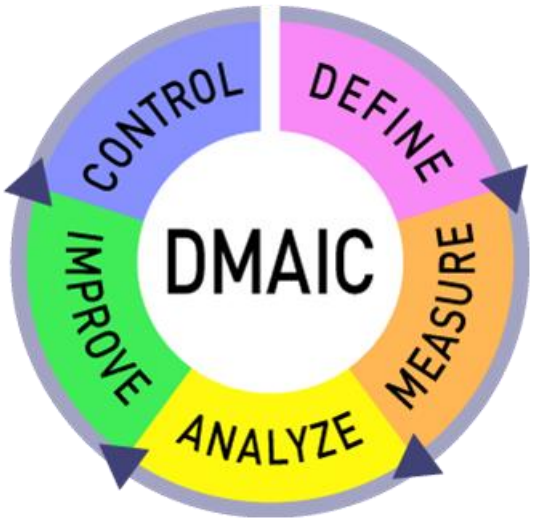
Cylindrical Bearing Cage

Steering Bearing Cages

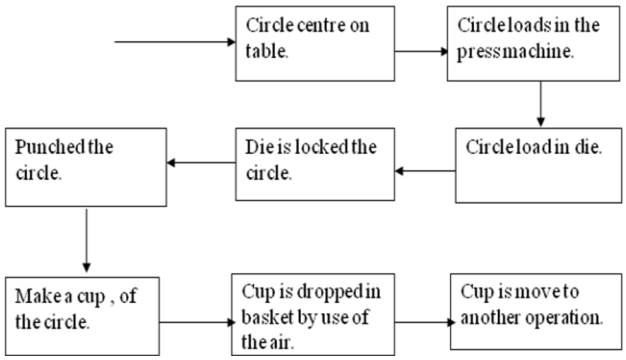
The DMAIC improvement cycle



Problem in ring bore



Process Mapping



Cause-and-Effect Diagram

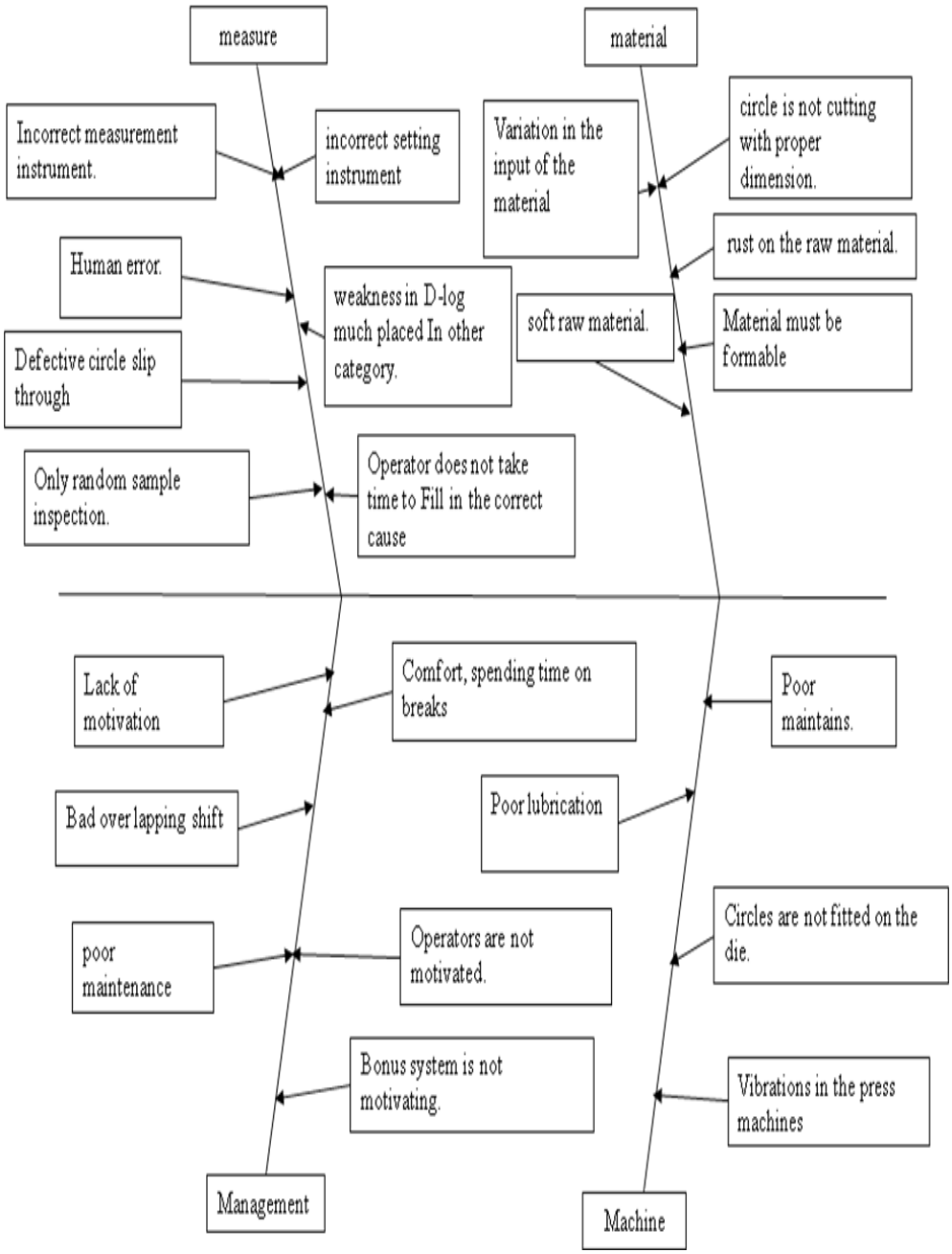
The starting point of the Cause-and-Effect Diagram was the question:

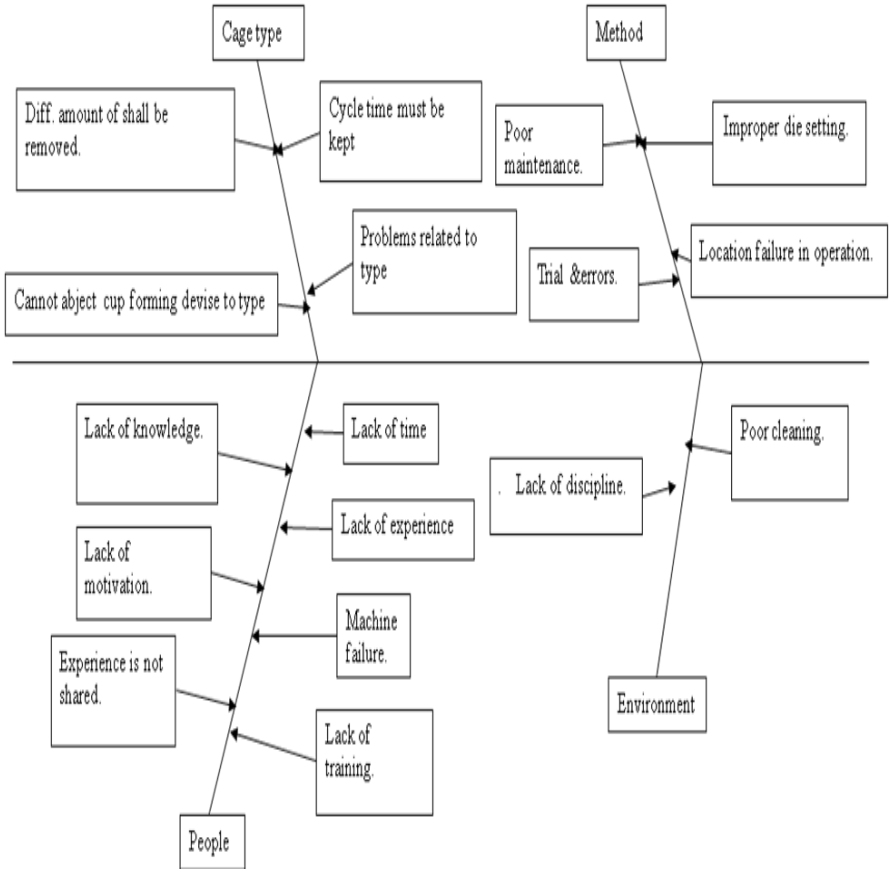
"What causes customer complaints in taper roller bearing cage due to the cup forming activity?"A bearing industry suffering from large amount of defects in honing machine during the manufacturing of bearing. In the honing machine, the ‘Arbor’ is used to locate the inner ring for honing. Due to relative motion between rotating inner and static guiding arbor, lining marks (Fig. 2) are generated at bore of inner ring, which cause poor quality and high rate of rejection.

Measure phase: In measure phase data were collected for the existing technology used and base line performance of the company which is described below in Table 1.

Control phase: Controlling the new changes in any organization is bigger challenge. The outcomes of the improvement are talk over with the various department of organization and to sustain the continuous improvement of the system following actions are taken:

- Proper maintenance of the machines should be taken timely.
- Kaizen should be performing at each level of organization and by everyone.
- Skilled labour should perform the operation
- Timely trainings should give to the operators.





Improvement phase: The cause & effect diagram suggested there is need of improvement. The main cause of problem is existing design of arbour is not appropriate for production. The relative motion between rotating inner ring and static guiding arbour is may be the problem. With the help of people from production department, all possible causes were understood and all ideas were noted down for improvement.

Corrective action: Designing of new arbour: The spring arrangements are introduced in the arbour to provide uniform pressure on face of inner ring while rotation. After improvement in design of rotating arbour relative motion generated between the inner ring and rotating arbour is reduced.

The problem taken in this project is very critical in the perspectives of quality. The product quality is improved very nicely (Fig. 6). Results are compared before and after using LSS by visual inspection after inner track honing operation. After using DMAIC methodology in bearing industry following benefits were obtained.

- Rejection due to bore marking issue during honing eliminated.
- Improvement in product quality.
- Productivity improvement due to rejection control.

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