Process Improvement through Root Cause Analysis In Assembly Shop of Manufacturing Unit

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***Abstract*— Root-cause identification for quality and productivity related problems are key issues for manufacturing processes. It has been a very challenging engineering problem particularly in a multistage manufacturing, where maximum number of processes andactivities are performed. However, it may also be implemented with ease in each and every individual set up and activities in any manufacturing process. Process improvement is series of action taken to identify, analyze and improve existing processes within an organization. Continuous improvement in productivity can only be realized by means of systematic analyses and optimization of production processes, reduce defect cost, repair cost. A successful continuous improvement program is one where in the operational defects are eliminated at the root cause level and are prevented from reoccurring. In present work an attempt is made to identify the areas of process improvement. Selection of problem and Analysis of problem has to be done. Possible root cause is analyzed by cause & effect diagram. Validation of each cause under man, machine, material, method is done is done to find the actual root cause of problem. Further root cause analysis is done by why – why analysis. The implementation of solution increased production as decrease in lead time. Customer fulfilment tends to motivate business partner. Non value added activity such as sorting, repair, rewash has been eliminated. Lean manufacturing system can be applied to any area in need of improvement. Kaizen and Poke Yoke are aimed at producing more and more value with less and less wastes, attaining better working environment. Kaizen is used extensively in product, process and production development. Continuous improvement in product quality and productivity can only be realized by means of systematic analyses and optimization of production processes, intends to increase productivity and efficiency.**

***Keywords*— Bearings, RCA(Root cause analysis),validation.**

Introduction

Root Cause Analysis (RCA) is such an approach which in a systematic manner tries to understand what the real causes are, in such a way to find an appropriate remedy. Root-cause identification for quality and productivity related problems are key issues for manufacturing processes. It has been a very challenging engineering problem particularly in a multistage manufacturing, where maximum number of processes and activities is performed. However, it may also be implemented with ease in each and every individual set up and activities in any manufacturing process.This paper presents study of implementation of process improvement techniques to reduce bearing noise problem in assembly process. The areas of equipment improvement are identified and cause and effective diagram, why-why method of root cause analysis (RCA), pareto analysis were used for elimination of problems.

Primo &Spectrum 3 Phase cage induction motors

METHODS IN ROOT CAUSE ANALYSIS

Following methods were used for the process improvement

- Cause and effective diagram
- Why-Why analysis
- Pareto analysis

Cause and effective diagram

A cause and effect diagram (also known as fishbone diagram) is a pictorial representation of all possible causes which are supposed to influence an "effect" which is under consideration. For every effect there are likely to be several causes. They can be classified under man, methods, materials, machines and environment. Further for our analysis of problem, we have used man, method, machine and material.

Why Why analysis

It is a method of questioning that leads to the identification of the root cause(s) of a problem. A why-why is conducted to identify solutions to a problem that address its root causes. Rather than taking actions that are merely band-aids, a why-

why analysis helps to identify how to really prevent the issue from happening again.

Why why analysis under man, machine

WHY	Answer
Why Noise observed during internal testing/during customer inspection/customer complaint	Improper bearing assembly/heating of bearing/apply of grease/hitting of cover with metallic hammer/cleaning of component
Why Improper bearing assembly/heating of bearing/apply of grease/hitting of cover with metallic hammer/cleaning of component	No proper method for fixing covers/cleaning the components
Why no proper method for fixing covers/cleaning the components	Process sheet for above and proper grease application method
Why process sheet for fixing the covers and other process	To reduce noise observed during internal testing

Why Why analysis under method

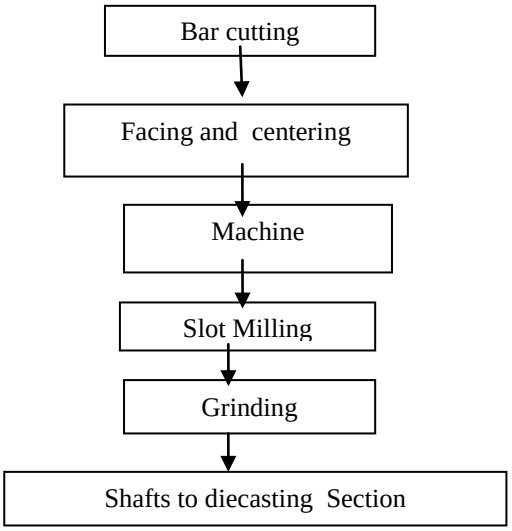
WHY	Answer
Why Surface finish for shaft / cover / body not as per specification	Surface finish for shaft / cover / body not as per specification
Why Surface finish for shaft / cover / body not as per specification	Regular dressing for grinding machine / proper tooling's for components are not being used
Why regular dressing for grinding machine / proper tooling's for components are not being used	We have instruct to provide instrument for checking surface finish at supplier end

. **CORRECTIVE ACTIONS**

Sl.no	Corrective actions	Action taken
1	Quality of bearing From analysis ,observed that more rejections was other than SKF make bearings for the frame is 63 to 100	Procure SKF make bearings for the frames 63 to 100
2	Surface finish of bearing mounting area Grinding finish on shaft and burnishing of cover bore	Action to ensure grinding finish on shaft and burnishing
3	Bearing fitting tolerance From the analysis, NC observed min and max size of the covers bearing bore and shaft overall dimension(OD)	Action taken to maintain the dimensions of the cover and bore and shaft diameter close to mean
4	Concentricity of body and cover to spigot Spigot finish machining with reference stator bore	Action taken to ensure

1.1 Motor Assembly Process

1.1.1 Shaft Line



RESULTS AND DISCUSSION

The solution discussed in the brainstorming and after feasibility study, foreseeing probable resistance the results after implementations for each problem are shown below

Bearing assembly method

Bearings are pressed using hydraulic machine reduces some percentage of noise in motors so during brain storming session it is decided to press the DE and NDE covers using hand press machine for frame size 63 to 180 size

Hammering method

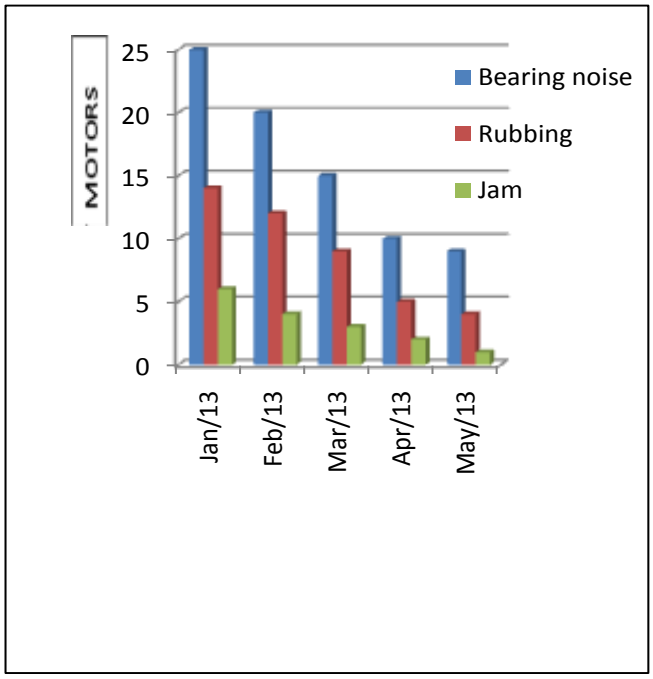
Fixing of covers by hitting of metallic hammer is one of major cause for noise. For 63 to 90 frame size hand press machine installed as discussed before. For 90 to 180 frame size motors covers were fixing using metallic hammer. Hence nylon hammer is used to fix the covers in to the motor body which reduces the bearing noise. Nylon hammer is soft

compare to metallic hammer hence there will no pressure on bearings, this reduces bearing noise.

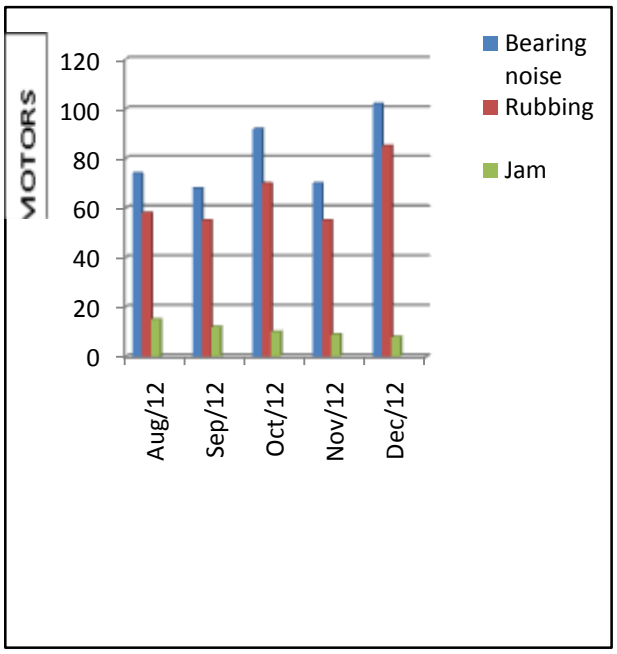
Bearing Dimensions

After the corrective actions discussed, bearings are properly checked before assembly of motors

Pareto analysis



PARETO ANALYSIS FOR AFTER IMPROVEMENT



Pareto analysis before improvement

CONCLUSIONS

The Kaizen, Poka Yoke, Root cause and why-why analysis techniques have been proven as effective tools for the process improvement and even for organisational designs. Successful implementation results in a cooperative atmosphere where everyone is aware of the key goals and measures of success. The project helps to find the root cause for bearing noise, and find solution for this cause. This project helps to reduce the non-conformance of motors from the customers and to improve the quality of product, cause and effective diagram, pareto analysis and why-why methods are effective tools for reduce the defects

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