

Quality Improvement of Adaptors Using Kaizen Technique

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Abstract- Quality improvement is a systematic formal approach to the analysis of practical performance and effort to improve performance. Understanding and properly implementing quality improvement is essential practice in improving efficiency, safety or outcomes. One of the best suitable methods to achieve quality improvement is Kaizen. We are going to use kaizen technique and its associated tools to effectively analyze and overcome the problems in the die casting industry. Kaizen is nothing but continuous improvement. This project focuses on quality improvement of the 'Adaptors' which is manufactured in Sigma Electric Manufacturing Corporation Pvt. Ltd. Hence we are working on to reduce the rejection, to increase the productivity, minimum scrap and reduction in rework of 'Adaptors' to an optimum level. However, it is combined efforts on the part of many people. It requires some time, money and employee education.

Keywords: Quality Improvement, Kaizen, Pareto chart, Poka Yoke, 5S, productivity.

1. INTRODUCTION

'Adaptor' is the product manufactured in the Sigma Electric Manufacturing Pvt. Ltd., Chakan. Adaptors are exported to various electric industries. The basic manufacturing process used for this production is die casting followed by gate cutting, fettling, shot blasting or glass beading, machining and painting.

During the process flow of adaptors, various defects frequently occur. Most of the times casting porosity offers a tough challenge during production. Problem of dents is also significant as it directly affects the aesthetic of the component. Moreover, during painting, sometimes problems like paint uncover, excess paint, edge built up etc. may occur.

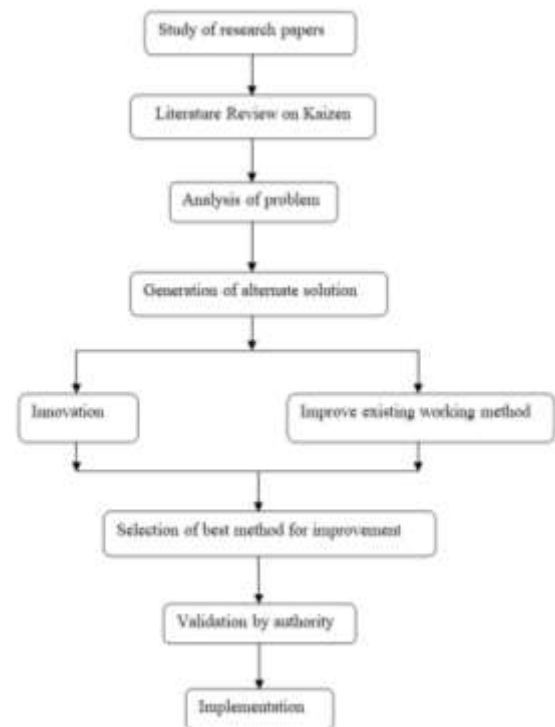
To reduce these defects and to improve the overall quality of adaptors, we are using kaizen technique. Kaizen is the Japanese word in which 'Kai' stands for 'Change' and 'Zen' stands for 'Good'. Kaizen is one of the most widely used methodologies for the industrial quality improvement.

Kaizen is also the parental philosophy of 5S, Poka-Yoke Kanban, Automation, 7 quality control tools and elimination of 7 MUDA.

2. SCOPE

Though the kaizen philosophy was developed for large scale industries, it finds application in other sectors also. Application of kaizen is in the area of development, organizing and optimization in production based workshop and many areas.

3. METHODOLOGY



IV. LITERATURE SURVEY

[1] (Dipak Gauri, Ajay Gajbhiye, Shubham D. Gadekar 2015). This paper is about how to apply the Kaizen

technique for productivity improvement in Bajaj Industries Limited at Immamwada in Nagpur. This problem observed during Kaizen implementation are solved with better working efficiency, better working environment, continuous work production, Under these circumstances, the implementation of lean tool Kaizen, improves the production environment with moderate investment. This case study carries evidence of the genuine advantages when applying Kaizen to the manufacturing shop floor. In this study productivity is an average measure of the efficiency of production.

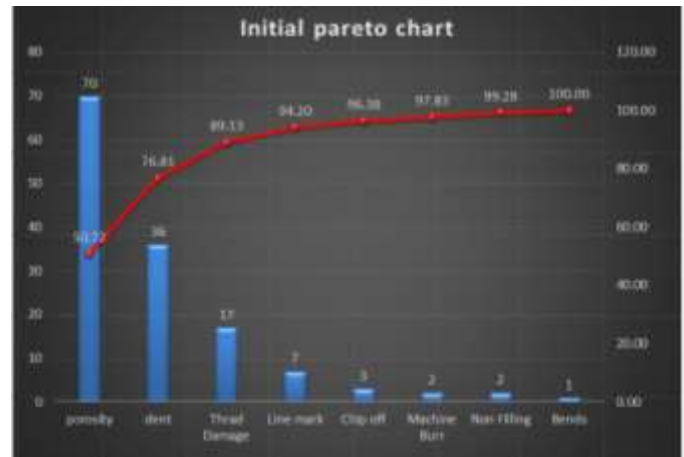
[2] (Ms. Shubhangi P. Gurway, Oct. 2016). This paper explains the basic definitions of kaizen philosophy and a brief review of kaizen concept with its implementation. This paper represents Kaizen and its related terms in the concrete way. The paper also contains the case study about improving the overall efficiency of the small scale manufacturing company by implementation of kaizen. The company was facing the problems of increased lead time and stock out situations. To overcome all these situations, all the problems are studied keenly and some small but effective corrective actions were taken.

[3] (Dinesh B. Shinde, Prashant N. Shende, 2014). This paper emphasizes on the 5S on the workplace. Paper contains an overview on the every 5S principle with respective examples of each. The main areas of study in this paper are proper utilization of storage space and arrangement of departments in desired sequence. They analyzed the material flow in the industry by graphical format. Thus they identified the product lag time and came up with their own material flow idea in the industry.

[4] (Jignesh A. Bhoi, Darshak A. Desai, Rohit M. Patel, 2014). They highlighted the importance of kaizen in this paper. This paper contains detailed discussion on kaizen and its tools. Each tool is discussed in details with proper visuals.

5. CASE STUDY

Pareto analysis of defects in Adaptors: Pareto analysis is a formal technique useful where many possible courses of action are competing for attention. This technique helps to identify the top portion of causes that need to be addressed to resolve the majority of problems. It is common to refer to pareto as "80/20" rule, under the assumption that, in all situations, 20% of causes determine 80% of problems.



Conclusion from Pareto analysis:

Almost 80% of the defects are arising due to only 2 defects namely dent & porosity. Maximum rejection can be overcome by eliminating these defects. So, we concentrate on these defects first.

5.1. POROSITY

Casting porosity can be mainly caused due to following parameters: casting pressure, die construction and die surface. In order to select the most appropriate action plan, we studied these parameters and concluded that casting pressure should be increased along with modified gating system. There were two types of machines available for the die casting; one which was already being used with 350T capacity and the other one of 420T capacity. Their respective pressures were 980 bar for former and 1100 bar for the latter one. The earlier total rejection due to porosity was 20.09% which after replacement of machine, dropped to 2.65%.

5.2. DENTS AND SCRATCHES

As an aluminum based casting industry, dents offer a great challenge to the industry. Dents are prone to occur during handling and during processes. We observed the flow of adaptors during motion study analysis and found some sources of occurrence of dents. During the transportation of batches of adaptors between different work stations, numbers of castings were carried in a single bin where adaptors would come in contact with each other and lead to scratches. We provided special bins for adaptors having separate compartment for each casting in order to prevent their mutual contact. We designed an exclusive fettling

fixture for adaptors to simplify the process of fettling. Also, we designed a cooling tray at machining section so that the adaptors being cooled should not contact with each other. Along with this, we observed that the air spray gun had a metallic nozzle which was sometimes coming in contact with castings and result in dents on the Adaptors. Hence, we provided a rubber coating to the nozzle in order to prevent any scratches even if the nozzle comes in contact with casting. The earlier rejection rate was 10.39% and after doing the above mentioned modifications, the rejection was found to be 2.33%.

5.3. PAINTING DEFECTS

Painting defects include mainly overspray, oil marks, uncover. Painting defects are very sensitive as it is directly related to the aesthetics of the product and may lead to complete rejection. After complete inspection of painting process, we decided to improve the existing masking as the majority of defects were caused due to the masking. Earlier masking used to cover the internal thread was resulting into paint uncover. We modified the diameter and chamfer of the masking. Also top face masking already was in use was Silicon masking. It came with the sticky glue which was the main reason for oil marks. In addition to that, the Silicon masking had some cases of paint overspray. In order to overcome that, we designed the metal masking of the same size. The results were found satisfactory. The other advantage of modifying the masking was the reduction in rework percentage from 94% to 2%.

5.4. EXPANSION STUDY

Curing is the process carried out after painting. During this process components are held at 210° C for 50 minutes. Due to this heating, component was undergoing thermal expansion. This was resulting into over dimensioning of the Adaptor by around 30 micron (maximum). In order to cater this thermal expansion, the CNC machine was set to the lower limit by 20 micron. Hence any expansion occurring henceforth was under the upper limit specified by the customer.

5.5. PRODUCTIVITY IMPROVEMENT

Productivity improvement is also an important aspect of kaizen. We observed each process from the time study analysis and came to the conclusion that, the glass beading process was taking relatively more time resulting into stockpile of castings at that section. Glass beading was

performed in order to provide required surface for paint adhesion. There was similar process available in the industry called shot blasting with little inferior quality of surface. But that much quality was not expected by the customer. Hence we compared the parameters of both the machines.

Parameter	Glass Beading	Shot Blasting
Quality	More	Less
Cost	More	Less
Operator Intervention	Continuous	Intermittent
Average Cycle Time	71 seconds	26 seconds

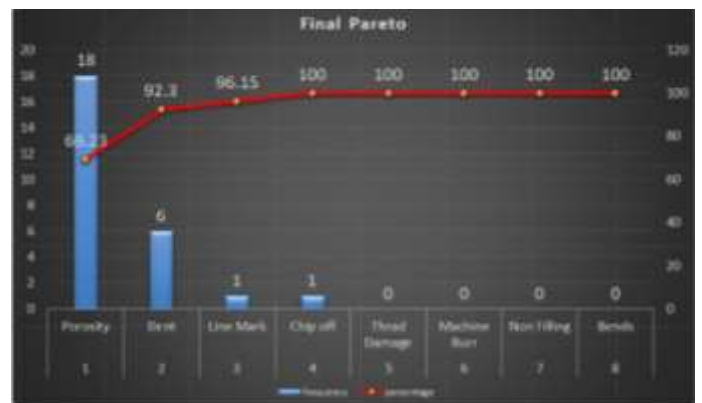
After studying all the parameters of both the machines, we opted for the replacement of glass beading operation with shot blasting.

6. RESULTS

After the implementation of all the improvements, the overall rejection percentage was found to be reduced from 39.27% to 8.67%.

7. CONCLUSION

From above study it is evident that the positive approach with kaizen is implemented in Sigma Electric Corp. and the problems observed during kaizen implementation are solved with better working efficiency, better working environment and continuous work production. Also from all the literature reviews, we come to the conclusion that the kaizen practices can also be effectively used in small manufacturing industry as a productivity improvement tool.



8. REFERENCES

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