ENIGMA OF QUALITY CONTROL TOOLS IN MANUFACTURING INDUSTRY OF NORTHERN INDIA-A CASE STUDY

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Abstract: The significance of quality has been long acknowledged in the business environment in order to obtain privileged quality products. In manufacturing environment, quality improves consistency, increases productivity and customer satisfaction. In order to survive in a competitive market, improving quality is must for any company. Quality Control (QC) tools are necessary to get better quality of products. The north Indian auto parts manufacturing industry is facing the problem of quality in spring pin parts. The rejection of spring pin component is found to be 9.71%. Keeping in view the quality aspect of the company, QC tools are being implemented to reduce the defects of spring pin section. After implementation of QC tools, the defects in spring pin section has been reduced to 7.96 per month.

Keywords: Quality Control (QC) tools, auto parts manufacturing, and quality products.

1. INTRODUCTION

Continuous quality improvement process assumes, and even demands that team of experts in field as well as company leadership actively use quality tools in their improvement activities and decision making process. Quality tools can be used in all stages of production process, from the beginning of product development upto product marketing and customer support. The main goals of the quality tools are customer satisfaction by delivery of defect free products at quality cost. The primary objective of quality control in any organization is to reduce the cost of its operation. If control efforts do not lead to any saving in costs or cost reduction then, in principle there is no need of quality control. The conducted research has investigated possibilities of successful application of seven quality control tools.

Jatinder Pal (2012) reduced the monthly rejection of the casting components from 10% to 8.7% [1]. It is possible to reduce 50% of the most critical defective component and an overall reduction of 29% in the level of nonconformities in the preparation section by sings Quality Control tools [2]. A total of Rs. 12,677.57/year for an operation of control valve cylinder head. Grewal and Gill (2007) applied statistical process tools in Indian bicycle industries [3]. Poor understanding difficulty index (2.5) and high work load difficulty index (2.42) are the major difficulties encountered by the bicycle manufacturer. Patel et al. (2014) concluded that QC tools are used to improve the quality level by finding out the root causes of the problem [4]. A study has been carried out at Miranda tools by using QC tools. Defects of Taper shank drills during production process reduced.

2. INTRODUCTION TO INDUSTRY AND PROBLEM FORMULATION

The north Indian auto parts industry began its journey in the year 1938 in Ludhiana. The strength of company is its people with their engineering skills, crystallized over a period of five decades this has brought about total customer satisfaction. It is a proud supplier of components to various Indian original equipments manufacturers (OEMs) and has established itself as a reliable supplier for last so many years. The list of OEM customers includes Telco, Volvo India Limited, Swaraj Mazda Limited, Mahindra &
Mahindra, Maruti Udyog Limited., Ashok Leyland, Punjab Tractors Limited etc. The Company has fully flanged with the modern testing facilities, equipments and workshops. Casting shop, machine shop, non ferrous foundry, wire drawing, electroplating, heat treatment, welding, paint shop, tool room, store, packaging and dispatch are the main section of the company. Approximate one thousand employees have been working in the various sections of the company.

The company is producing large number of components for automobile sector in different section. It is being noticed that the rejection of spring pin is 9.71% which is on higher side because of many quality related problems in manufacturing of spring pin. The major causes explored for rejection were wire drawing process was not done on 100% basis which leads to bending of components. Grinding marks were occurring after short interval due to improper dressing time. The depth of cut varies due to shifting of cutter. The length of the workpiece has not inspected after band saw cutting operation. Tool marks observed due to improper dressing of tool and using blunt tool etc in manufacturing of spring pin. The study is an attempt to reduce rejection of spring pin by implementing Quality Control (QC) Tools.

3. RESULTS AND DISCUSSION

3.1. Rejection Trend of Spring Pin

Fig. 1 shows the rejection trend of the spring pin from January to March. The average rejection of the spring pin component has approximate 9.71% which is alarming.

3.2. Pareto Analysis

Fig. 2 shows the Pareto analysis of the spring pin defects. Spring pin defects a to i represent along x-axis and cumulative rejection represents along y-axis. 1st seven defects contribute More Than 80% in rejection. Tool marks defect contribute maximum 26.22% and Nipple thread damage Defect Contribute least i.e. 1.73 % in rejection.

In Fig. 2 a to i represent followings defects:

(a) Tool marks = 1064 pieces
(b) Material cracks = 1043
(c) Metal diffusion = 679
(d) Grinding marks = 315
(e) Setting = 280
(f) Dia u/s = 252
(g) Uncleaned surface = 231
(h) Miscellaneous = 119
(i) Nipple thread damage = 70

3.3. Fishbone Diagram for Tools Marks Defects

Fig. 3 shows the maximum possible reasons of spring pin defect. Man, Method, Machine and Materials are the main elements of the fishbone diagram.

3.4. Counter measure for Tool Marks Defect (Man)

A1. Sufficient training provided to operators regarding the causes & cures of tool marks defects.

A2. Specific work instructions provided to operators regarding the tool marks defect. Check
the machine condition (fitment of screws, dowels & cleanliness) properly. Check the condition of the machine before load the workpiece. In case of any discrepancy inform to the maintenance Incharge. Inspection is done with proper gauge. Inspection of manufactured products is done on regular basis.

3.5. Counter measure for Tool Marks Defect (Method)

B1. Wire drawing process should be done on 100% basis to avoid tool marks and ovality of the components.

B2. Friction is there between work piece and tool interface. So, proper coolant is used while machining to reduce the friction. Coolant also decreases the temperature of the material and therefore the Surface finish of the work piece.

B3. Tool marks occur due to improper marking of advancement of cutter on Work piece. Therefore marking is done properly. Work piece get loosened and not aligned with axis of the cutter. Therefore while cutting, tool marks appear on the work piece surface. So the protective action is to be taken to avoid the tool marks. Proper clamping of the work piece is done regularly.

B4. It should be suggested to use hydraulic clamping for the desired process.

Figure 3: Fishbone diagram for Tool marks defect
3.5.1. Counter Measure For Tool Marks (Material)

C1. Tool has to be replaced and must check by the operator.

C2. Bending of rod and oval shape in material is the main cause of the tool marks defects. All the material should be initially drawn on straightening machine on 100% basis. According to production, one more straightening machine is required. Blunt tool should not be used in the process.

Same technique is also used to reduce the other defects like grinding marks, uncleaned surface etc.

From Apr to June
Total no. of pieces from Apr-June = 45871
Rejected pieces = 3652
% age of rejection = 3652/45871 * 100 = 7.96%
Tool marks defect= 745/45871*100=1.62%
Grinding marks = 189/45871*100=0.41%
Setting = 185/45871*100=0.40%
Uncleaned surface = 243/45871*100=0.52%
% age of rejection reduced:
Tool marks defect= 2.55-1.62=0.93%
Grinding marks = 0.75-0.41=0.34%
Setting = 0.67-0.40=0.27%
Uncleaned surface = 0.55-0.52=0.03%
Overall rejection reduced = 9.71-7.96=1.75%

5. CONCLUSION AND LIMITATIONS
The results demonstrated that the rejection of spring pin has been reduced by 1.75% (9.71% to 7.96%) per month. Quality Control Tools plays a significant role in improving the quality related issues of the manufacturing operations. The present study has outlined the significance of quality tools towards improving firm performance in a systematic manner. Moreover the dressing frequency of grinding wheel has been fixed after 150 pieces. Root cause helps to predict optimum solution of the problems related to the rejections of critical product. The selection of manufacturing industry is done on the basis of convenient sampling technique.

REFERENCES
[1] Pal Jatinder (2012), “implementation of QC tools in an automobile organization to reduce the rejection of the Casting Components” a case study (M.tech thesis work, GNDEC LUDHIANA)