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## TO MINIMIZE THE REJECTION IN MANUFACTURING INDUSTRY USING SEVEN QC TOOLS- A LITERATURE REVIEW

**Damanjit Singh  
Deepinder Singh  
Ravinderpal Singh Aujla**  
**ABSTRACT**

*Quality is defined as the effectiveness of a product which further enhances the reliability of finished parts. The main objective of this paper is to review the literature of published papers and it was seen that QC tools were very helpful in reducing the rejection rate and rework by enhancing the quality of product. Mostly Pareto analysis and Fishbone diagram are used to find out the root problems. After implementing QC tools the rejection rate reduced to a greater extent.*

### I. INTRODUCTION

Quality is a term used as the measure of perfection and the state of being free from flaws, fluctuations and errors and Quality control is defined as the method which controls the standards in manufactured parts by randomly taking and testing a specimen of the output against spec. It is important that consumers are given services & products which are useful Quality is a term used as the measure of perfection and the state of being free from flaws, fluctuations and errors and Quality control is defined as the method which controls the standards in manufactured parts by randomly taking and testing a specimen of the output against spec. It is important that consumers are given services & products which are useful and value every coin they pay for them. It must be noted that customer satisfaction should be on the highest priority in quality. It is very important to take use of 7 basic QC tools to control product quality and services which are going to be delivered.

#### **Importance of Quality:**

Quality plays a very crucial role in an industry, whether it is Manufacturing, Service or Education sectors etc. Quality merchandise facilitate to keep up client satisfaction and loyalty and cut back the chance and price of the commutation faulty product. Companies will build a name for quality by gaining certification with a recognized quality common place, like ISO 9001, printed by the global organization for Standardization. The quality of a part can be evaluated in terms of durability, reliability and performance. Quality management strategies like Total Quality management or Six Sigma have a typical goal to deliver a prime quality product.

#### **Quality control tools:**

- Flowchart
- Check-sheet
- Cause & Effect diagram
- Pareto chart
- Control chart
- Histogram
- Scatter diagra

### II. LITERATURE REVIEW

1. Kumar et al. (2009) introduced a study which highlights the decrease in scrap by using the total quality management tools in the pre-stressed concrete steel strands (PC wire) manufacturing industry. In the study, high quantity of scrap was detected and logic behind this was established by using TQM tools like Pareto analysis, brainstorming and cause & effect diagram. Main causes of waste were identified in the structure of leftover rings and rejections like over sized, under size and scratches. After implementing QC tools, scrap was reduced from 7.21 tonnes to 6.75 tonnes.

2. Soković et al. (2009) presented a review of the potential of the efficient usage of 7 QC tools. A methodology is proposed to engage the quality control tools in some aspects of the regular enhancement process (PDCA cycle), Lean Six Sigma, Design for Six Sigma (DMADV) and Six Sigma (DMAIC) techniques. These are commonly used as “Graphical Problem Solving techniques”. It was revealed that these tools are able to use in all procedures from the starting of a product enlargement for management of production method and delivery.

3. Srinivasu et al. (2009) described a statistical process control (SPC) methods which contribute the usage of the statistical principle approach at the whole phase of production. The main objective of SPC is to manage the quality tendency on machines, products and processes. The essential tool of SPC is a Shewhart control chart which computes the fluctuation as either a natural cause or special cause. In this paper, Statistical Quality Control and Quality Control tools are explained which helps to increase productivity.

4. Chandna and Chandra (2009) conducted a case study to reduce the forging defects of crankshaft manufactured by TATA Motors, Jamshedpur INDIA (previously known as TELCO). Various QC tools like cause & effect diagram, Pareto chart is used to study the reason behind the rejection. It was observed that 80% of rejection were due to underfilling, foreign body, overlap, pitting and dent. Proper measures were suggested to lower down the defects of crankshaft and may decrease the rate of rejection from 2.43% to 0.21% and rework from 6.63% to 2.15%.

5. Jozsef and Blaga (2012) presented a model which targets at presenting the influence of quality tools and human resources in various phases of production system in an organization. A plan was introduced for the collective management of quality tools and HRM (Human Resource Management) to obtain the best outcomes. The data were collected and arranged according to the defects. After applying QC tools, frequency of defects materials reduced from 44 to 5 seen from histogram.
6. Chauhan et al. (2013) evaluated a study on the use of seven quality control tools and their practicable examples in process industry. This paper is applies to current main conception on process enhancement and to display how these QC tools help to determine the troubles and enhances the quality in industries. These tools have a vital place in the collection of data, analyzing and visualization. It was observed during the study that systematic functions of seven quality control tools will facilitate the outstanding quality improvement process.
7. Fernandes et al. (2013) conducted a case study to enhance the quality level using QC tools and PDCA cycle is used as a methodology in solving the problem. QC tools and methods were practiced at different phases of work to reduce the nonconformities products. Histogram, Pareto chart and cause & effect diagram were used as QC tools. Moreover Taguchi Method was also employed, which plays a vital role in reducing the nonconformities. The result shows that there is a decrease of 29% in the quantity of nonconformities by applying QC tools.
8. Jadhav and Jadhav (2013) demonstrated a study to evaluate and decrease the casting rejection of cold shut in cylinder block of automobile of gray cast iron in a foundry. Basic QC tools like Cause & Effect diagram, Pareto analysis, Flowchart, Scatter Diagram, Histogram and Control Chart were used to find out the root causes of problems and to eliminate the rejections. It was seen that pouring temperature and alloy composition was the main problem for this defect. After applying QC tools, the total rejection of cold shut was decreased from 12.3% to 6.3%.
9. Bhosale et al. (2013) presented a paper to practice QC tools to figure out the issues relating to manufacturing of mechanical seal. The defects on the production line are examined by monitoring the production line and various SQC tools like cause & effect diagram, Pareto analysis, check sheets, histogram are used to improve the processes. From which it was stated that 80% rejection is due to seal ring pore, latex coating damage, etc. It has been concluded that QC tools are very helpful which can investigate, manage, enhance the processes and efficient to reduce the defects.
10. Jha et al. (2013) investigated a study to reduce the defects of canopy in automotive components. Pareto chart is used to find out the rejected component which are having more cost and data is collected for a period of one month through Checksheet. It was seen that an average of 17 canopies was rejected per month. Ishikawa diagram is used to study the reason behind the rejection and it was studied that the shape of the canopy is not perfect, so the author had designed a fixture arrangement to attain a desired shape. Using QC tools and realization in the design, the rejection is reduced and hence saved Rs.520200/year.
11. Chauhan et al. (2014) presented a model in which PDCA (Plan Do Check Act) methodology and different quality control tools were adopted to enhance the quality of taper roller bearing. The objective of this research was to present a practicable illustration that there is a probability of functions of quality control tools. Pareto chart, Histogram and Cause & Effect diagram were used in the study to determine the defect and to better the manufacturing production by eliminating the defects and rework. It was observed that the rejection rate is decreased from 48.8% to 36.4% by the application of QC tools.
12. Magar and Shinde (2014) presented the applications of QC tools for the regular advancement of manufacturing processes. The main objective of this paper is to enhance the quality stage by implementing these tools. QC tools are used for the data collection, analyze, evaluating the origin and determining the results. Correlation of QC tools and PDCA cycle were also described in this paper. It was concluded that the regular usage of QC tools updates the organizational characteristics and improves their capability to develop ideas, clarify issues and make appropriate planning.
13. Parmar and Deshpande (2014) highlighted a study on the implementation of statistical process control (SPC) techniques in the industry to find out the problems and to reduce various defects using QC tools. To evaluate the fluctuations, control charts are used which is a commonly used tool. It was seen that the rejection rate was decreased from 2.43% to 0.21% and rework from 6.63% to 2.15%.
14. Bouras (2014) presented a modern approach to find out the causes of hindrance in communication among health care doctors in local hospital. QC tools were used as a methodology on the basis of Six Sigma principles like Cause & Effect diagram to recognize the various factors which affects the communication in the surgery department. Using QC tools, the results came out very beneficial by giving a solution to use the smart phones for the communication and mobile access to patient reports due to which doctors can compose quicker decision without coming back to the wards to see the test results or condition of patients.
15. Patel et al. (2014) conducted a case study in Taper Shank Drills Manufacturing Industry. The objective of this paper is to achieve and solve the quality related issues which the industry is facing. In this study, PDCA cycle is used as a methodology in correlation with QC tools. Using these tools, various problems were found such as run-out due to heat treatment, calibration problem (instrument), human error and due to machine capability (RPM). After implementing QC tools, the result shows that these tools are very effective to reduce these causes and helps to enhance the quality.
16. Joshi and Jugulkar (2014) presented a study to reduce the various casting defects such as porosity, mold shifting, shrinkage, misrun etc., which occurs due to inappropriate mold making and sand preparation methods in an automotive component manufacturing foundry. The data is evaluated with the help of QC tools such as Pareto analysis, Cause & effect diagram to find out the proper reason and corrective factors to enhance the quality level and productivity of an Industry. It was observed that after taking the remedial actions and by implementing QC tools, defects were reduced by more than 30%.

17. Vante and Naik (2016) conducted a study to reduce the rejection rate of 3 cylinder metric blocks in a casting unit which was facing a huge rejection. It was revealed that the fluctuation was at a water jacket wall thickness, which was a main defect. QC tools like Why-Why analysis, Pareto analysis and Cause & Effect diagram were used to minimize the rejection. By implementing Quality tools, the rejection rate gets lowered from 7% to 2.13%.

18. Arndt and Lanza (2016) presented a three step methodology which facilitates overall operative organizations to dynamically arrange efforts with regard to quality control approach in various production system. The first step includes the development of a quality control plan which is a technique for decision of development potentials. Second step includes simulation approach which is used to classify the consequences of various quality measures due to which identification can be done for the production system with a quality control plan and in the last step, network simulation is widened by an assessment module which evaluates the quality control method.

19. Deepak and Dhingra (2016) conducted a case study in a bicycle industry to enhance the quality of the rims of bicycles and to explain the performance of QC tools. The study is conducted to reduce the rejection by the use of quality control tools such as Pareto chart, Fishbone diagram which are implemented to better the product quality. It is observed that different parameters like heated water temperature, heated water quality, material chemical composition, heating voltage, etc. have a direct impact on the final product quality which has to be handled to eliminate the rejection. The result shows that rejection was decreased from 9.45 % to 7.75% and cost saving of Rs. 3.54 Lakhs a year.

### III. CONCLUSION

Rejection is a major concern in every manufacturing industry. A lot of work had been done to minimize the defects and to maximize the overall revenue of an industry. Most of the researchers relied on two tools which were Pareto chart and cause & effect diagram. Pareto chart was used to identify the common defects which were higher in cost and cause & effect diagram was used to find out the root causes. Nearly 10% to 20% rejection was minimized by applying these tools.

QC tools will also be beneficial in future where rejection rate will dominate.

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#### AUTHORS

**Mr D. Singh**, M. Tech Student, Department of Industrial Engineering, Guru Nanak Dev Engineering College, Ludhiana, Punjab, India  
Email: daman2508@gmail.com

**Prof. D. Singh**, Assistant Professor, Department of Mechanical Engineering, Guru Nanak Dev Engineering College, Ludhiana, Punjab, India  
Email: deepinder13@gmail.com

**Mr. R.S. Aujla**, M Tech Student, Department of Industrial Engineering, Guru Nanak Dev Engineering College, Ludhiana, Punjab, India  
Email: ravindersahnewal93@gmail.com