International Journal of Scientific Research & Engineering Trends
Volume 7, Issue 6, Nov-Dec-2021, ISSN (Online): 2395-566X

# A Review on Quality Improvement in Shaft Manufacturing Industry Usingseven Quality Tools

**M. Tech. Scholar Anand Kumar, Prof. Hari Mohan Soni**
Department of Mechanical Engineering,
BIST, Bhopal,MP,India

**Abstract- In today highly competitive scenario the markets are becoming global and economic conditions are changing fast. Customers are more quality conscious and demand for high quality product at competitive prices with product variety and reduced lead time. It is a data-driven quality strategy used to improve processes. It is an integral part of a Six Sigma initiative, but in general can be implemented as a standalone quality improvement procedure or as part of other process improvement initiatives such as lean.Any enterprises that cannot manage the quality of its methods and products have a tendency to fall apart. Quality is crucial to sales, price control, productivity, risk control and compliance. As essential as quality is, there's little agreement as to its definition. Therefore, in this study, seven quality tools have been reviewed.**

**Keywords- Quality, seven quality tools, productivity.**

## I. INTRODUCTION

The art of meeting customer specifications, which today is termed as "quality". Quality is the symbol of human civilization, and with the progress of human civilization, quality control will play an incomparable role in the business. It can be said that if there is no quality control, there is no economic benefit. In the current world of continually increasing global competition it is imperative for all manufacturing and service organizations to improve the quality of their products [1].

Because of the negative consequences of poor quality, organizations try to prevent and correct such problems through various approaches to quality control. Broadly speaking, quality control refers to an organization's efforts to prevent or correct defects in its goods or services or to improve them in some way [2] [3].

Some organizations use the term quality control to refer only to error detection, whereas quality assurance refers to both the prevention and the detection of quality problems.

Organizations must have a department or employee devoted to identifying defects and promoting high quality. In these cases, the supervisor can benefit from the expertise of quality-control personnel [4].

## II. BASIC 7 QUALITY CONTROL TOOLS

The basic 7 quality tools are

- Check Sheet
- Histogram
- Pareto Chart
- Cause and Effect Diagram
- Flow Chart
- Control Chart
- Scatter Diagram

### 1. Check Sheet:

Check sheets are simply charts for gathering data. They are easy to understand and very clean to read.

### 2. Histogram:

A histogram is a snapshot of the variation of a product or the results of a process. It often forms the bell-shaped curve which is characteristic of a normal process. The histogram helps to analyse what is going on in the process whether the data is falling inside the bell-shaped curve and within specifications [6].

### 3. Pareto Chart:

The Pareto chart can be used to display categories of problems graphically so they can be properly prioritized. Pareto chart is a vertical bar graph displaying rank in descending order of importance for the categories of problems, defects or opportunities [5-6].

### 4. Cause and Effect Diagram:

The Cause and Effect Diagram display the relationships between different causes for the effect that is being examined. The major categories ofcauses are put on major branches connecting to the main line, and various sub-causes are attached to the branches.

### 5. Flow Chart:

Flow chart breaks the process down into many sub-processes. Analysing each of these separately minimizes the number of factors that contribute to the variation in the process.

### 6. Control Chart:

As discussed above they are used to monitor the process.

**7. Scatter Diagram:**
A Scatter plot is used to show how a pair of variables is related and the strength of that relationship. It is constructed by plotting two variables against one another on a pair of axes [8].

## III. QUALITY IMPROVEMENT METHODS

Within this broad framework, managers, researchers, and consultants have identified severalmethods for ensuring and improving quality. Today most organizations apply some or all of these methods, including statistical quality control, the zero-defects approach, employee involvement teams, Six Sigma, andtotal quality management [9].

**1. Statistical Quality Control:**
It rarely makes economic sense to examine every part, finished good, or service to ensure it meets quality standards. For one thing, that approach to quality control is expensive. In addition, examining some products can destroy them. As a result, unless the costsof poor quality is so great that every product must be examined, most organizations inspect only a sample. Looking for defects in parts, finished goods, or other outcomes selected through a sampling technique isknown as statistical quality control.

The most accurate way to apply statistical quality control is to use a random sample. This means selecting outcomes (such as partsor customer contacts) in a way that each has an equalchance of being selected. The assumption is that the quality of the sample describes the quality of the entire lot [2].

**2. Zero Defect Approach:**
A broad view of process quality control is that everyone in the organization should work toward thegoal of delivering such high quality that all aspects ofthe organization's goods and services are free of problems. The quality-control technique based on thisview is known as the zero-defects approach. An organization that uses the zero-defects approach provides products of excellent quality not only because the people who produce them are seeking ways toavoid defects but also because the purchasing department is ensuring a timely supply of well-crafted parts or supplies, the accounting department is seeing that bills get paid on time, the human resources department is helping find and train highly qualified personnel, and so on [2].

**3. Employee Involvement Teams:**
Recognizing that the people who perform aprocess have knowledge based on their experiences, many organizations directly involve employees inplanning how to improve quality. Many companies setup employee involvement teams such as quality circles, problem-solving teams, process improvement teams, or self-managed work groups. The typical employee involvement team consists of up to 10 employee's and their supervisor, who serves as the team leader. In thisrole, the supervisor schedules meetings, prepares agendas, and promotes the participation and cooperation of team members [3-4-5].

**4. Six Sigma:**
Applying the terminology and methods of statistical quality control and the strong commitment ofthe zero-defects approach, manufacturers and othercompanies have used a quality-control method they call Six Sigma. This is a process oriented quality-control method designed to reduce errors to 3.4 defects per 1 million operations, which can be defined as any unit ofwork, such as an hour of labour, completion of a circuitboard, a sales transaction, or a keystroke. (Sigma is a statistical term defining how much variation there is in aproduct.

In the context of quality control, to achieve alevel of six sigma, the output of operations would be 99.9997 percent perfect.) Along with the basic goal ofreducing variation from the standard to almost nothing, Six Sigma programs typically include a rigorous analytical process for anticipating and solving problemsto reduce defects, improve the yield of acceptable products, increase customer satisfaction, and deliver best-in-class organizational performance [9].

**5. Total Quality Management:**
Bringing together aspects of other quality control techniques, many organizations have embraced the practice of total quality management (TQM), an organization- wide focus on satisfying customer's by continuously improving every business process for delivering goods or services. Thus, it is not a final outcome but an ongoing commitment by everyone in the organization. Today most companies accept thebasic idea of TQM that everyone in the organization should focus on quality [10].

## IV. QUALITY CONTROL PLANS

As with the other responsibilities of supervisors, success in quality control requires more than just picking the right technique. The supervisor needs a general approach that leads everyone involved to support the effort to improve quality [12].

**1. Prevention versus Detection:**
It is almost always cheaper to prevent problemsfrom occurring than it is to solve them after they happen; designing and building quality into a product is more efficient than trying to improve the product later. Therefore, quality-control programs should not be limited to the detection of defects. Quality control also should

include a prevention program to keep defects from occurring. One way to prevent problems is to payspecial attention to the production of new goods and services. In a manufacturing setting, the supervisor should see that the first piece of a new product is tested with special care, rather than wait for problems to occur down the line.

Also, when prevention efforts show that employees are doing good work, the supervisor should praise their performance. Employees who are confident and satisfied are less likely to allow defects in goods or services [13].

**2. Standard Setting and Enforcement:**
If employees and others are to support the quality-control effort, they must know exactly what isexpected of them. This calls for quality standards. Inmany cases, the supervisor is responsible for setting quality standards as well as for communicating and enforcing them. These standards should have the characteristics of effective objectives: They should be written, measurable, clear, specific, and challenging but achievable. Furthermore, those standards should reflect what is important to the client [10-11].

**3. Using Control Chart:**
Control chart is the most populated quality tool.

The main reasons of their popularity are [2]:

- A proven technique for improving productivity.
- Effective in defect prevention.
- Prevent unnecessary process adjustment.
- Provide diagnostic information.
- Provide information about process capability.
- Problem Statement

## V. LITERATURE REVIEW

**T. R. Vijayaram et al (2010)** reviewed paper, some of the solutions and quality control aspects are explained in a simplified manner to eliminate the unawareness of the foundry industrial personnel who work in the casting manufacturing quality control departments.

**Raghwendra Banchhor, S.K. Ganguly (2010)** reviewed published research on green sand casting process. The effects of riser design, gating system, moulding sand, oxidation and deformation of casting during heat treatment, machining allowance, etc., on the economical manufacture quality castings were reviewed.

**Sushil kumar et al (2011)** analyse casting defects and concluded that, the quality can be improved by Six Sigma i.e. (DMAIC) approach of parameters at the lowest possible cost. It is also possible to identify the optimum levels of signal factors at which, the noise factors effect on the response parameters is less. The outcome of their case study is to optimize the process parameters of the green sand castings process, which contributes to minimize the casting defects.

The optimized parameter levels for green sand casting process are moisture content (4.0%), green strength (1990 g/cm2), pouring temperature (14100C) and mould hardness number vertical & horizontal (72 & 85) respectively.

**Udhaya Chandran. R.M (2011)** focused to minimize the casting Defects such as, sand drop, sand blow holes, scabs, pinholes. In that by using Taguchi method is a powerful problem solving for improving quality of the product. The parameters considered are moisture content (%), Green Strength (g/cm2), mould hardness, sand practical size. The Taguchi approach is used to capture the effect of signal to noise ratio of the experiments Based on the orthogonal array used due to optimum conditions are found. The outcome of this paper that the selected process parameters continuously affect the casting defects in foundry. The improvement expected in reduction of casting defects is found to be 47.66%.

**D.N. Shivappa et al (2012),** found the four prominent defects in casting rejections. They noticed that defectssuch as Sand drop, Blow hole, Mismatch, andOversize in Trunion Support Bracket (TSB) castingsare frequently occurring at particular locations.

**Prachi K. Tawele, Laukik P. Raut (2012)** studied the defect of casting i.e. war page can be reduced. These will helpful to quality control department of casting industries for analysis of casting defects. Also the casting simulation technology has now days become a beneficial powerful tool for casting defect troubleshot. This will reduce the lead time for the sample casting; improved productivity. In general, warpage can be eliminated by iteratively designing (gating) system and by referring methods which helps in analysis of casting defects may minimizes the rejection of casting.

## VI. COCLUSION

Seven quality tools have been used in the production industries like automotive element production, metal processing, gloves manufacturing, record manufacturing, laser mouse production, semiconductor production, grinding operations, rolling generators. Seven quality tools additionally have been used in the carrier industries like health center and academic institute.

The Seven quality tools additionally discovered its application in shipping commitment fulfilment project. This study will help small scale industry to initiate seven quality tools initiatives of their businesses and improve their overall performance in phrases of client satisfaction in addition to monetary advantages with increase in competitiveness in global market of manufacturing.

## REFERENCES

[1] B.R. Jadhav, Santosh J Jadhav, "Investigation And Analysis of Cold Shut Casting Defect And Defect Reduction By Using 7 Quality Control Tools", International Journal of Advanced Engineering Research and Studies, ISSN: 2249–8974, September 2013.

[2] Pranay S. Parmar, Vivek A. Deshpande, "Implementation of Statistical Process Control Techniques in Industry: A Review", Journal of Emerging Technologies and Innovative Research, ISSN: 2349-5162, Vol 1, Issue 6, November 2014.

[3] Varsha M. Magar1, Dr. Vilas B. Shinde, "Application of 7 Quality Control (7 QC) Tools for Continuous Improvement of Manufacturing Processes", International Journal of Engineering Research and General Science, ISSN 2091-2730, Volume 2, Issue 4, June-July, 2014.

[4] Uday A. Dabade, Rahul C. Bhedasgaonkar,"Casting Defect Analysis using Design of Experiments (DoE) and Computer Aided Casting Simulation Technique", Elsevier Forty Sixth CIRP Conference on Manufacturing Systems,2013.

[5] Aniruddha Joshi, L.M.Jugulkar, "Investigation And Analysis Of Metal Casting Defects And Defect Reduction By Using Quality Control Tools", International Journal of Mechanical And Production Engineering, ISSN: 2320-2092, Volume- 2, Issue- 4, April-2014.

[6] Chirag B. Patel, Dr.Hemant R. Thakkar, "Reducing Casting Defects And Improving Productivity In A Small Scale Foundry: A Review", International Journal of Advance Research in Engineering, Science & Management, Volume 3, Issue- 4, April-2014.

[7] R. B. Heddure, M. T. Telsang, "Casting Defect Reduction Using Shainin Tool In Ci Foundry – A Case Study", International Journal of Mechanical And Production Engineering,Volume- 2, Issue- 6, PP: 70-73.

[8] Vivek V. Yadav, Shailesh J. Shaha, "Quality Analysis Of Automotive Casting For Productivity Improvement By Minimizing Rejection", International Journal of Mechanical And Production Engineering, ISSN: 2320-2092, Volume- 4, Issue-6, PP: 1-8.

[9] Jitendra A Panchiwala1, Darshak A Desai, Paresh Shah, "Review on Quality and Productivity Improvement in Small Scale Foundry Industry", International Journal of Innovative Research in Science, Engineering and Technology, Vol. 4, Issue 12, PP: 11859-11867.

[10] Patel Rumana, Darshak A. Desai, "Review Paper: Quality Improvement through Six Sigma DMAIC Methodology", International Journal of Engineering Sciences & Research Technology, Vol. 3, Issue 12, PP: 169-175.

[11] Chintan C. Rao, Darshak A. Desai, "A Review of Six Sigma Implementation in Small Scale Foundry", International Journal of Innovative Research in Science, Engineering and Technology, Vol. 4, Issue 12, PP: 11894-11897.

[12] Anuj kumar, Naveen kumar, Dinesh kumar, "Defects Reduction In Brake Drum In Foundry Shop Using DMAIC Technology", International Journal of Scientific Research Engineering & Technology, Volume 6, Issue 7, PP: 114-119.

[13] Jaykar Tailor, Kinjal Suthar, "Review on Defects Reduction in Multiple Sector by Using Six Sigma DMAIC Methodology", International Conference on Ideas, Impact and Innovation in Mechanical Engineering, Volume5, Issue 6, PP: 111-116.

[14] Suraj Dhondiram Patil, M MGanganallimath, Roopa B Math, Yamanappa Karigar, "Application of Six Sigma Method to Reduce Defects in Green Sand Casting Process: A Case Study", International Journal on Recent Technologies in Mechanical and Electrical Engineering, Volume 2, Issue 6, PP: 37-42.

[15] Harvir Singh, Aman Kumar, "Minimization of the Casting Defects Using Taguchi's Method", International Journal of Engineering Science Invention, Volume 5, Issue 12, PP: 6-12.

[16] Patil Sachin S., Naik Girish R., "Defect Minimization in Casting through Process Improvement-A Literature Review", Journal of Mechanical and Civil Engineering, Volume 14, Issue 2, PP: 9-13.

[17] Rohit Chandel, Santosh Kumar, "Productivity Enhancement Using DMAIC Approach: A Case Study", International Journal of Enhanced Research in Science, Technology & Engineering, Vol. 5, Issue 1, PP: 112-116.

[18] Darshana Kishorbhai Dave, "Implementation Of DMAIC Methodology To Casting Industry", International Journal of Advance Engineering and Research Development, Volume 4, Issue 8, PP: 369-374.

[19] B. R. Jadhav and Santosh J Jadhav, "Investigation And Analysis Of Cold Shut Casting Defect And Defect Reduction By Using 7 Quality Control Tools", International Journal of Advanced Engineering Research and Studies, Vol. 2, Issue 3 PP 28-30.