

Quality Circle: A Methodology to Identify Scope of Quality Improvement through Kaizen Approach

Sandeepsoni, Dr. Ravinder Kumar², Rajkumar Duhan³, Sunil Duhan⁴

¹M. Tech (M &A), Department of Mechanical Engineering, UIET, MDU Rohtak

²Assistant Professor, Mechanical Engineering Department, Maharaja Agrasen Institute Of Technology

³Assistant Professor, Mechanical Engineering Department, UIET-MDU, Rohtak - 124001

⁴Research Scholar, Department of Mechanical Engineering, UIET, MDU Rohtak

ABSTRACT: Kaizen has become one of the important tools for getting improvement in any field i.e. production, process, quality, maintenance etc. in the premises of manufacturing industry. Kaizen can be achieved through better performance done by team players work together to achieve the goal of any industry. Thus Quality circles are introduced which keep the improvement on track through team work. This research paper is refers to an empirical study of Kaizen approach based upon Quality Circle in which extensive literature studied chronologically. The conclusion of the study implies that Quality Circle methodology along with Kaizen approach is helpful tool in achieving improvement in process, product and quality for manufacturing industries. A case study is discussed in this research paper which provided evidence of improvement in product quality of small scale industry by using Quality Circle Methodology.

Keywords: Quality Circle, Kaizen, Case study, Root Cause Analysis, Process Improvement.

I. INTRODUCTION

To face these challenges and to survive for excellence; the responsibility for product quality has gradually shifted from operator to foreman to inspector and later to quality control department. 'Quality Circles' is one of the quality control techniques which have been widely used by the organizations to achieve good quality and acceptability among the customers. The word 'quality' has been derived from Latin word 'Qualis' means, 'what kind of'. With a variety of meanings and connotations attached to it, 'quality' is a difficult and illusive term to define, having thus been referred to as a slippery concept. It is slippery because it has a wild variety of meanings. The word implies different things to different people. Much confusion over the meaning of quality exists, because it can be used both as absolute concept to convey status and potential advantage and a relative concept when measuring against a specification.

Quality Definitions: Quality Guru's Overviews

- According to Juran, "Quality is fitness for use therefore quality products should meet or exceed customer requirements".
- According to Crosby, "Quality is conformance to requirement. Thus requirement must be clearly stated so that these cannot be misunderstood".
- According to Feigenbaum, "Quality is the total composite product and service characteristics of marketing, engineering, manufacturing and maintenance through which the product and service in use will meet the expectations of the customer".
- According to Karou Ishikawa, "Quality does not mean the quality of product but also of after sale service, quality of management, the company itself and the human life".
- According to G. Taguchi, "Quality is the loss imparted to society from time the product is shipped".
- According to ISO 9000:2000 "Quality is the degree to which a set of inherent characteristics, fulfill requirement and as the fitness for purpose meets requirement, delighting customer's right first time and all the time.

Quality Circles: Concepts & Evolution

In India quality circle was first initiated in an engineering company Bharat Heavy Electricals limited (BHEL). Starting from engineering workshops, quality circles spread in other service departments of BHEL such as personal, purchase, hospital, administrator, worker's canteen etc. presently, at national level quality circle in India have gradually spread to chemical, pharmaceutical and other processing plants including even the more traditional jute and textile mills. Typical examples of the companies are BASF, Durgapur steel plant,

Hindustan antibiotic etc. there are several other companies successfully operating quality circle in India both in public and private sector. QCFI was formed as a nonprofit national body in April 1982. Quality circles forum of India has member from various manufacturing and non-manufacturing organization in India. The forum has also published its booklets entitled quality circle at a glance in ten different languages, training for quality circles etc. All India Organization who have implemented quality circles are the members of QCFI starting the initiative from BHEL. QCFI has now been taken or the coordination committee of the international convention of quality circles which holds its convention annually at different venues. Earlier it was organized in Japan, Korea and other countries in rotation. India and QCFI has hosted an international convention on quality Circle in December 1989 which was attended over 1200 delegates including 215 from sixteen other countries. The QCFI is the professional body revolutionized the operational movement of Quality circles in India.

II. LITERATURE SURVEY

In the 1980's decade, USA auto industry was in disaster condition. It was continuously losing market share to Japanese competitors. The Japanese automakers were making better quality cars with fewer defects resulting in better customer satisfaction and thereby creating better image across the world. The lack of ability of USA manufacturers forces them to follow the concept of lean manufacturing. It prompted new generation of researchers to do in-depth study of in order to uncover the secrets of success. Some researchers (Adler, 1993; Kamath& Liker, 1994; Spear, 1999; Sobeket al., 1999) made serious efforts studying various aspects of lean manufacturing in order to identify basic truths.

Ohno (1988), Shingo (1989), Womack et al. (1990), Monden (1997) and many other researchers made great contributions to popularize the lean approach. To analyze the implementation of lean approach, it is essential to study the inner working of companies following the basic principles of identified by various researchers over a time period. Researcher examined the lean principles implementation and inner workings of more than 50 companies in automotive sector in USA, UK and India. They studied production system, product development processes, supply chain management, and management style to see how these companies are following lean principles.

Rahman (1990) describe quality circle and use this technique to improve the productivity. Author implement in BISF (Bangladesh Industrial Sanitary Ware Factory) and enterprise of Bangladesh Industrial Corporation. The factory produces various types of insulator and sanitary ware for local market and export. In the study five different product were considered for analyze. These are then eliminated by implementing the suggestion recommended by quality circle member. Author found good results after implementation with decrease in rejection percentage.

Karlsson (1992) summarizes the idea in three principles: being global, building knowledge structures together, and operating in networks with other actors. Perhaps most important is the organization and building of hierarchies of technological knowledge for the development and production of products. There is one common denominator in the studies cited above: their ideas were generated through research in large companies, most commonly the global automobile industry (Karlsson, 1992; Womack et al., 1990).

Adler (1993) suggest that quality and productivity depend on management's ability to free workers from the coercive constraints of bureaucracy is not true. According to him, bureaucracy can be reformed to encourage innovation and commitments while standardization, if properly understood and practiced, help continuous learning and motivation. His two-year study shows that Toyota succeeded in employing an innovative form of Toyota's time and motion regimentation on the factory floor not only to create comparatively better productivity and quality standards but also to enhance workers motivation and satisfaction. It also provides a unique example of employee empowerment, where workers themselves design their procedures and involved in continuous improvement and leading to better employee-employer relationship.

Kamath and Liker (1994) went through study of best practices used by Toyota and other Japanese manufactures in supplier management and product development. They claim that Japanese structure their development programs tightly and use targets and prototype to keep suppliers in line. Japanese set clear, and understandable goals and communicate them consistently to suppliers. Japanese use schedules and targets as major coordinating mechanism. Toyota and others treat suppliers based on their capability and mutual alignment, not blind trust, is what binds important suppliers to customers. Surprisingly, number of lean tools and practices were actually similar to those used by USA companies. In fact, Toyota imported these ideas from US only and put them into practice (Ohno, 1988). However, the insight that Toyota applies underlying principles rather than specific tools and processes explains why the company continues to outperform its competitors.

Womack and Jones (1994) developed the lean concept further. They considered it as: "a group of individuals, functions, and legally separate but operationally synchronized companies". The idea is to link breakthroughs of individual companies, in terms of lean techniques, up and down the value chain to form a continuous value stream. Deming, W.E., (1943) encouraged employee participation as well as promotes teamwork and motivates people to contribute towards organizational effectiveness through group processes.

Mark Goh, (2000) has studied the role of quality circle as a management tool to enhance the effectiveness of library services. They concluded that if concept is appropriately implemented in the field of Library and Information Science the results and conclusions outcomes will not only be amazing but it will also help us to stumble on attitude over our own lacunae and facilitate designing of a better system.

Clive Goulden, (1995) describe quality circle in workshop of university polytechnic AMU, Aligarh. Author find the problem of material loss in workshop university polytechnic AMU, Aligarh.

Ozden Bayazit, (2003) determined various aspects of Quality Circle and how improvements can be made by adopting practices of Quality Circle in chemical industries. The paper also presents a comparative discussion of various features of Quality Circle, Quality Improvement Group and Work Group/Project Team. The paper describes a case study of QC concept in a chemical industry which illustrates the effectiveness of QC approach.

Michel Wensing PhD, Björn Broge (2004) determined the impact of a large-scale programmed of quality circles on quality and costs of prescribing method. A controlled before–after study was performed, in which primary care doctors were allocated to a quality circles group or a control group.

Abo-Alholet. al. (2005) describe about the performance of the quality circle in the both service as well as in manufacturing sector. Author states that quality circle in various countries are first introduced in the manufacturing sector and as the benefits expertise, published and confidence is built they introduced this in other areas and finally in service sector to survey the effectiveness of quality circles.

Prof. Dinesh P. Chapagain (2008) had studied Students' Quality Circle (SQC) activities in academics, students identify, analyze and solve their problems at school and at home by applying various QC tools in a QC team using QC story of systematic problem solving approach. This paper highlights the content analysis of the secondary information compiled from the proceedings of the recent national and international conventions on students' quality circles using KJ method. The result depicts that students have developed several characters deemed necessary to build leadership quality.

Salaheldin I. Salaheldin Mohamed Zain, (2007) deals with various aspects of Quality Circle and how improvements can be made by adopting practices of Quality Circle in petrochemical industries. The paper also presents a comparative discussion of various features of Quality Circle, Quality Improvement Group and Work Group/Project Team.

Benazir Bhayana (2011) Groups are formed where members interact to share Information and to make decision within the specific area of responsibility. Teams are different from groups. A team is a cross Functional group of employees with focused objectives and autonomy in achieving them.

Mr. Rajesh Chaudhary, Mr. Lalit Yadav (2012) had an attempt to focus on the impact of quality circle towards employees & organization. Employee's attitude towards participative management is also discussed in detail through the case study. The observed data are analyzed through cause-effect diagram, Pareto-diagram etc. The results and findings are not only amazing but also beneficial to both employees & organization. It results in - Drastic reduction in wastage, considerable increase in average saving, minimizing financial losses, and increased employee's motivation. By operating machine with care and minimizing wastage, the production & hence productivity increases considerably.

Chitra Sharma (2013) had given enough evidence as case studies has been reported till date on the usage of quality circle in many manufacturing organization for drawing cost saving or quality improvement goals. It argues that the concept encourages employee participation as well as promotes teamwork and motivates people to contribute towards organizational effectiveness through group processes.

Abhijit Chakraborty, Ranjan Bhattacharya (2013) focussed on the effect of quality circle when applied in small enterprises. In this competitive world, Process Development as per 'Voice of Customer' is the key word and the result there from is for better productivity and simultaneously cost-curtailment in production sphere of manufacturing. In this paper, effect of application of 'Quality Circle' has taken for finer tuning of process improvement in a small manufacturing enterprise and its impacts for the betterment of cost-effectiveness at the shop floor in various production processes have been analyzed to ascertain- to what extent the Quality Circle tool can be effective in the small enterprises of Indian environment for its betterment & making it competitive in the global market.

Akhil kumar (2014) Lack of Planning, Lack of top management commitment, Lack of Methodology, Unwillingness to learn and see and Human Aspects are the main barriers or problems which can be faced while implementing the Lean Manufacturing. These have already been discussed in the previous section. This paper shows that one of the major difficulties companies encounter in attempting to apply lean is not knowledge of particular tools and techniques, perhaps lack of comprehensive and suitable lean knowledge related to probable

problems within the companies by the managers, direction, gap and a lack of recognition of lean culture in whole of the organization and planning cause the fails within the implementations.

Alina Țenescu, Mirela Teodorescu (2014) "Whether you're a giant factory making computer components or cars, or an individual at a desk producing reports, budgets or plans, you're a factory", states

Markovitz, founder and owner of Time Back Management. One must thus take inputs and transform them into outputs that he/she wants. Markovitz also asserts that “the principles that underpin lean manufacturing—that enable companies to produce more value with less work—also apply at an individual level”. We conclude that lean manufacturing starts with the notion of 5S which has to do with maintaining a neat, organized workspace. 5S stands for sort, set in order, shine, standardize and sustain.

Kapil Deo Prasad Sanjay Kumar Anand Prakash(2015)This paper examines gender attitudes towards employee involvement scheme. Employee involvement (EI) has been the focus of considerable research on the management of people in organizations, particularly on whether EI results in improved employee attitudes and behaviors, and, in turn, company performance.

III. QUALITY CIRCLE CONCEPT

India, few companies have started implementing quality circles for last 20 years. Factories and all other organizations must implemented quality circles in an effective manner so that the nation, as a whole, can reap the full benefits and gains economically. The quality circle organization is an informal one with the formal organization, supporting each other to attain the corporate objectives. Some selected managers representing production, quality control, design and process planning from quality circle steering committee. This committee act as a policy making body for quality circles. The steering committee registers and monitors the quality circles in factories and organizations (Ramming and Blair 1982).

- **TOP management**

Top management must play an important role by attending the orientation courses on quality circles that must be specially design for them. They must inform all employees of their decision to implementing the quality circle program in the company. Whenever quality circles projects are presented, the top management should invariably attend those meetings. They must address the different training courses on quality circles organized for various lower levels of management and workmen. The top management must express verbally as well in writing their support and commitment to the quality circle programs.

- **Steering committee**

The managing director or CEO of the factor or organization must be the chairman and all HODs are the members of the steering committee. It must have members for various relevant departments. The duties of quality circles steering committee are listed below.

1. To define the ultimate goal of the quality circles program.
2. To formulate long range plans for the program viz. organizing the circles, selection of departments formulating policy on quality circles promotion, evaluating , incentives, training etc.
3. To select the facilitator and provide support by allocating maximum resources.
4. To stimulate and regulate the quality circles meetings.
5. To attend the quality circles project presentations.

Thus, the function of steering committee is to formulate policy and implement these in the factories and organizations.

- **Middle management**

A committeemiddle management is necessary for the success of quality circles program. They must establish the program in line with the steering committee program. Viz. deciding about the number of quality circles in each circles meeting time and facilities etc. their commitment must include:

1. Attending some quality circle personal meetings through their selected members.
2. Personal follow up of quality circles activates and training programs.
3. Provisional of resources for quality activities.
4. Organization of supervisor’s circles.

- **Facilitator**

The Facilitator serves as a link between top management, quality circles steering committee, middle management, circle leader and circle members. The duties of the facilitator are given.

1. Coordinate the training courses.
2. Get the support from top management, steering committee, middle management, circle leaders and circle members.
3. Assistant circle leaders and deputy leaders in conducting circle activities.
4. Provide the natural resources.

- **Circle leader**

Each circle head is headed by a circle leader. We introducing the quality circle in a factory, supervisors can lead the circle initially. Later on, workmen can take over the quality circles leader. Each workman will get a chance to become quality circle leader in rotation. The leader should maintain the enthusiasm of the member of motivation them in circles activities. He must inform the status of the circle to the top management; he must conduct circle meetings regularly and monitor the circle activities with respect to formulated work program. In the absence of leader, deputy leader may conduct quality circles meetings.

- **Circle members**

The circle members must participate actively in the circle activities such as meetings, discussion and develop the right attitude towards their work, supervisors etc. for quality improvements. A member must be conscious about productivity, quality productivity, quality and improvement which can be brought out with the operation of quality circles in an organization. Some known members may also be invited to quality circles meetings.

In first step, a quality circle is formed in automobile parts manufacturing industry. A steering committee is formed from and for the department in which quality circle is proposed. After formation the steering committee, a group leader and a deputy group leader were selected from supervisor of that department. After these selection, the worker are invited to join the quality circle voluntarily who work as quality circle members.

- **Brainstorming**

In first step, a quality circle is formed in automobile parts manufacturing industry. A steering committee is formed from and for the department in which quality circle is proposed. After formation the steering committee, a group leader and a deputy group leader were selected from supervisor of that department. After these selection, the worker are invited to join the quality circle voluntarily who work as quality circle members. After identifying the problems from operator to top level management everyone is the part of quality control system but the main responsibilities are taken by the persons that are selected for quality control from their respective areas. These people go around in their respective areas collect data analyze the problems and reaches to a solution or to a solving technique. This process is called brainstorming. So the main Quality Control Tools that we used to solve the problems.

- **Data Compilation**

Data compilation is taking survey or evaluation answers, gathering them into a database, and analyzing the results for further suggestions, improvements, and/or recommendations.

For the above mentioned problems data collection was the initial step, because to gain better output it's necessary to have correct input. And data from several sources and of a definite time taken in certain condition represents the better picture of problem than any other method.

- **Implementation**

Implement the feasible ideas to minimize or eliminate the problem which are highly contributed to the total no. of problem. The implementation is done on the basis of Kaizen philosophy.

IV. IMPLEMENTATION OF QUALITY CIRCLE METHODOLOGY

Methodology adopted for the case study has been shown in Figure 1.1. The Quality Circle Methodology is studied in small scale industry manufacturer of automotive parts situated at Old IDC, Rohtak. The case study is conducted for the purpose to successfully implementation of Quality Circle Methodology with Kaizen approach. Final Inspection area of small scale industry is found where in house rejection and customer rejection is recorded for each product and process. It is the last stage of thoroughly inspection of every product. A record of product inspected and rejected to scrap is maintained to know PPM level. The higher PPM (part of rejected per million of product) of any product mean higher the quality cost to the manufacturing industry that can be identified as problem. Pareto chart is used for the purpose to identify the most contributed problem among many problems generated in the final inspected areas shown in Chart 1.1 given below. From the further study it is found that outer diameter oversize and length undersize problems are the major contributor (around 80%) to the overall problems produced to the finished product. A steering committee which is a group of volunteers is formed. A team leader and team members selected from supervisor of that department. All workers of the industry are invited to join the quality circle team to improve the performance of industry by reducing no. of defects of selected problems. This team is responsible for reducing defects to zero level through training to all employees of industry. Now a meeting is conducted for healthy brain storming session with a view to find the solution of the identified problems of products i.e. Sleeve Spark Plug, Shaft Rocker Arm and Axle (Front &

Rear). The problem is defined precisely and everyone is invited to provide their valuable suggestion or ideas regarding permanent solution of these problems.

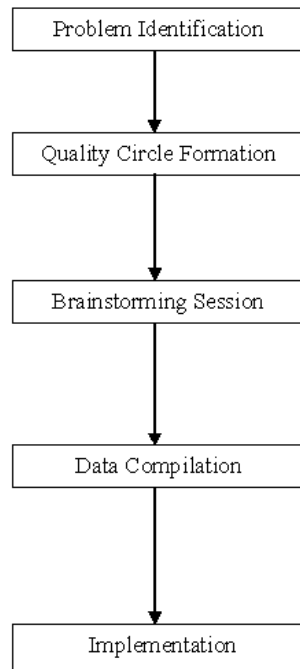


Figure 1.1 Methodology Adopted

Data compilation is done by taking evaluation of each answer provided and gathering them into a database, and analyzing the results for further suggestions, improvements, and/or recommendations. The selected Kaizen is implemented by Quality Circle Team for the purpose to reduce defect and improves the quality of product by using following case study. The details of case study in which implementation of Quality Circle Methodology by using Kaizen approach is discussed below.

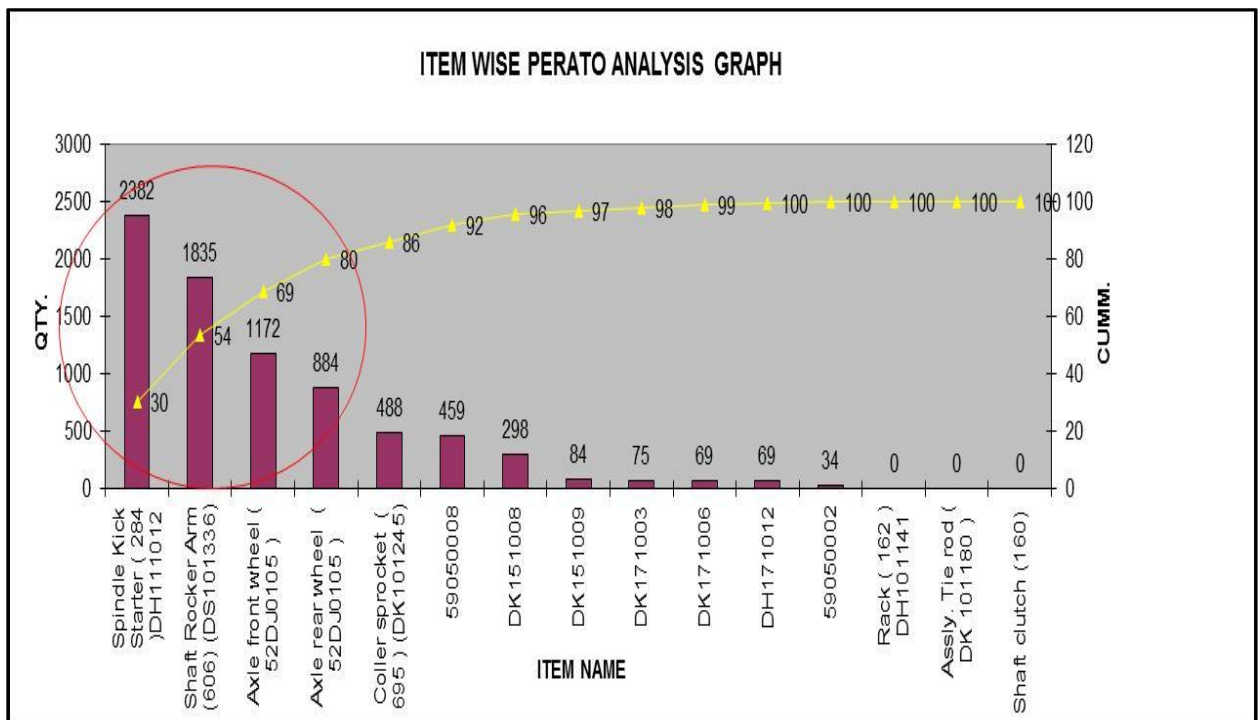


Chart 1.1 Product Wise Pareto Chart Analyses

Description of Case Study for Quality Improvement:

- **Product Name:** SKS
- **Problem Description:** To Eliminate the face unclean problem in In-process & Steps on OD in final inspection. O. D. undersize problem
- **Present Status:**
 - O.D. Under Size
 - Step on O.D.
 - Face unclean pieces occur in In-process & Final inspection.
- **PPM Level:** PPM=24519
- **Why-Why Analysis:**
 - Why 1: Face unclean in C.N.C Turning operation.
 - Why 2: During centering & facing operation operator was not properly rest the component face with stopper face.
 - Why 3: Due to operator negligence.
- **Root Cause of Problem:**
 - Due to operator negligence.
- **Corrective and Preventive Action:**
 - Provided both sides stopper in the fixture as shown in Figure 1.2.
 - By monitoring the In-process inspection Quality status.
 - By monitoring the Final inspection Quality status

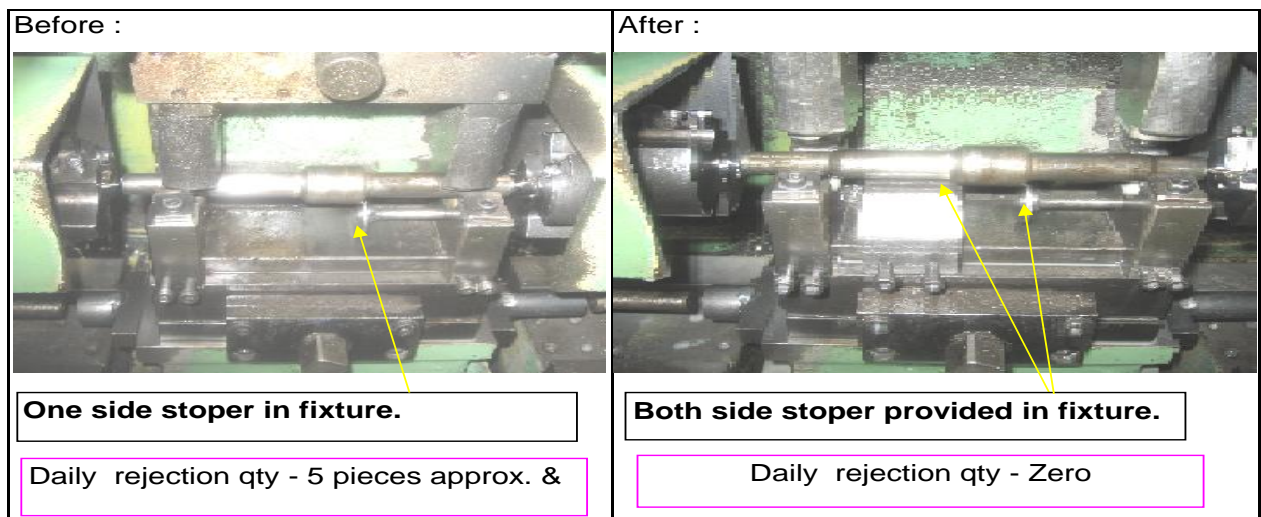


Figure 1.2 Both Sides Stopper Provided in Fixture after Kaizen 3

- **Result Analysis:**
 - Eliminate the face unclean problem during C.N.C Turning operation.
 - Eliminate the operator negligence during centering & facing operation.

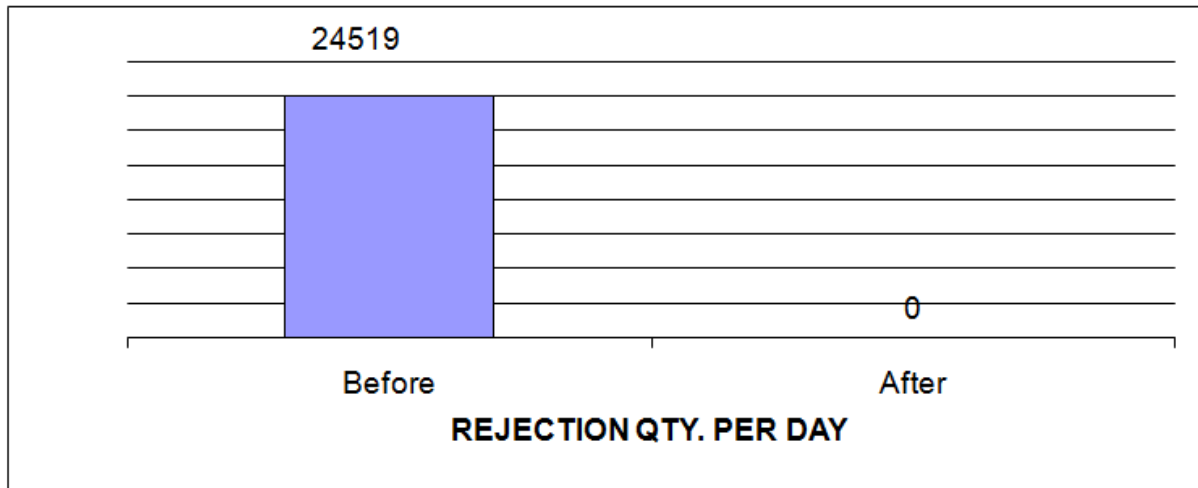


Chart1.2 PPM Before and after using both sided fixture

• **Benefits:**

- Component face rest properly with stopper face.
- No chances of failure by operator during centering & facing operation.
- Unclean problem eliminate during CNC operation.

V. CONCLUSIONS AND DISCUSSIONS

A Quality Circle team is generated within an industry and analysis of all process and product is carried out for finding opportunity of improvement. The proposed Kaizen are scrutinized for selection of fruitful Kaizen activity. These ideas are implemented by Quality Circle team which may help in achieving efficient production by improvement in various processes. It may also works in providing platform to individuals to implement self-suggestions for improvements in any concern area with an outstanding team helps in improving work and work culture. In this research work process, production and quality may be improved through process elimination, achieving zero defect quality level and reduction of parts per million opportunities while implementation of Kaizen approaches through Quality Circle.

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