Piyush Savkare,2023, 11:6
ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

Improving Productivity in Flexible Manufacturing Environment

M.Tech. Scholar Piyush Savkare, Yogesh P Ladhe, Vipul Upadhayay
Department of Mechanical Engineering
SDITS Khandwa,MP,India

Abstract-Improving productivity in a flexible manufacturing environment involves optimizing processes, utilizing technology, and fostering a culture of continuous improvement. Implement automated systems and robotic solutions to handle repetitive tasks, allowing human workers to focus on more complex and value-added activities. Use robotics for material handling, assembly, and quality control to increase efficiency and reduce cycle times. Utilize APS systems to optimize production schedules, considering factors like machine availability, workforce capacity, and customer demand. Real-time scheduling can help adapt quickly to changes in demand or unexpected disruptions. The key to success lies in a holistic approach that combines technological advancements, process optimization, and a commitment to continuous improvement across all levels of the organization.

Keywords- Productivity, flexible manufacturing environment, quality control

I. INTRODUCTION

The definition of a manufacturing system is "the arrangement and operation of basic resources such as machines, tools, material, and human labour with the strong flow of information pertaining to production or services having positive value addition in order to enable the production as well as its manufacturing/service cost to be measured by the standard of comparative advantage."

Management, manpower, equipment, material, techniques, finances, and a matrix (the "7Ms") are constantly in short supply. In order to stay afloat in the face of stiff competition, it could be necessary to make the most of the basics. The utilisation of automated machinery, such as those shown in Figure 1.1, is essential to the production process(Computer Numerical Controlled machines), Automatic Storage and Automatic Retrieval System (AS/RS), Automated Material Handling System like Automated Guided Vehicles (AGV), Robots.

Manufacturing systems play a pivotal role in transforming raw materials into finished products, serving as the cornerstone of economic development and technological advancement. Over the years, these systems have evolved significantly, adopting innovative technologies and methodologies to increase efficiency, reduce costs, and enhance product quality. Advancements in automation and computerization led to the development of Flexible Manufacturing Systems.

FMS integrates computer-controlled machines with material handling systems, allowing for rapid reconfiguration of production lines to accommodate varying product specifications. This adaptability empowers manufacturers to respond swiftly to changes in market demand and product design, while maintaining high levels of efficiency.
In the digital age, Computer-Integrated Manufacturing represents a convergence of information technology, automation, and manufacturing processes. CIM employs computer

systems to control and manage the entire production process, from design and planning to execution and quality control. This integration enables real-time monitoring, data-driven decision-making, and a seamless flow of information throughout the production cycle. The Fourth Industrial Revolution, often referred to as Industry 4.0, marks the integration of cyber-physical systems, the Internet of Things (IoT), artificial intelligence, and big data analytics into manufacturing processes. Smart Manufacturing leverages these technologies to create interconnected, intelligent production systems. These systems have the capacity to autonomously make decisions, optimize processes, and adapt to changing conditions, leading to unprecedented levels of efficiency, customization, and innovation.

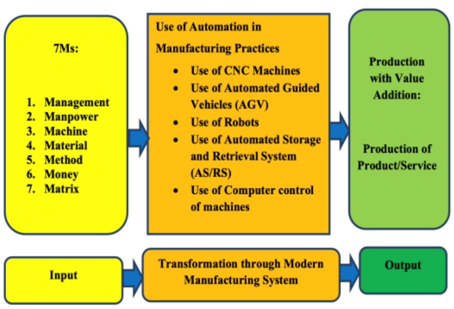

Figure 1: Manufacturing System

The evolution of manufacturing systems reflects humanity's relentless pursuit of efficiency, quality, and innovation. From the artisanal craftsmanship of the past to the highly automated smart factories of the present, manufacturing has come a long way. As we stand at the precipice of a new era marked by Industry 4.0, it is evident that the fusion of technology and manufacturing will continue to shape our world, driving economic growth, enhancing product quality, and fostering a culture of innovation.

II. PROBLEM STATEMENT

In all processes the smallest variation in quality of raw material, production conditions, operator behaviour and other factors can result in a cumulative variation (defects) in the quality of the finished product.

Now a days, every company or Organization want to improve or increase their output and productivity to achieve their yearly target by eliminating some causes and production time that affect profit for company. In flow line production, the product moves to one workstation due to time restriction. The present company is facing a rejection due to some defect, after observing data of the company most frequently rejected part. Faster station is limited by slowest station. Thus, decreasing the rate of productivity. As the demand are not met by the company, productivity improvements techniques are used to identify the bottleneck process in production line and eliminate them to achieve the goal of the company.

III. PRESENT WORK

The aim of study is to find out the effective way of improving the quality and productivity of a production line in manufacturing industry. The objective is to identify the defect of the company and create a better solution to improve the production line performance [15]. Various industrial engineering technique and tools is implementing in this study in order to investigate and solve the problem that occurs in the production. However, Quality Control tools are the main tools that will be applied to this study [16]. Data for the selected assembly line factory are collected, studied and analyzed. The defect with the highest frequency will be the main target to be improved. Various causes of the defect will be analyzed and various solving method will be present. The best solving method will be chosen and propose to the company and compare to the previous result or production. However, the implementation of the solving methods is depending on the company whether they wanted to apply or not [17].

IV. OBJECTIVE OF STUDY

In today’s challenging market, every organization is looking to achieve higher quality and productivity. This can be easily achieved if you focus on the reduction in various defects which causing rejection of the components [18]. This is the most viable

International Journal of Science,
Engineering and Technology

An Open Access Journal

strategy and it will also lead the organization towards effectiveness in competitive market.

The objectives are as follows:-

1) To identify the root factors causing defects
2) To improve the quality by reducing the defects
3) To improve entire manufacturing process
4) To improve the quality
5) To improve the productivity of manufacturing company

V. ANALYSIS

Control chart is the seventh and most effective tool of Total Quality Management (TQM). This chart displays of a quality characteristic that has been measured or computed from a sample versus the sample number or time. The chart contains a centre line that represents the average value of the quality characteristic corresponding to the in-control state (That is, only chance causes are present). Two other horizontal lines, called the upper control limit (UCL) and the lower control limit (LCL). These control limits are chosen so that if the process is in control, nearly all the sample points will fall between them. As long as the points plot within the control limits, the process is assumed to be in control and no action is necessary.

However, a point that plots outside of the control limits is interpreted as evidence that the process is out of control, and investigation and corrective action are required to find and eliminate the assignable cause or causes responsible for this behaviour. It is customary to connect the sample points on the control chart with straight-line segments so that it is easier to visualize how the sequence of points has evolved over time. This type of control chart is applicable equally to manufacturing and service organizations. In a manufacturing organization, manufacturing time and quality may be accepted as good or bad. Attributed data are counted and cannot have fractions or decimals. Attributed data arise when to determine only the presence or absence of something, success or failure, accept or reject, correct or not correct.

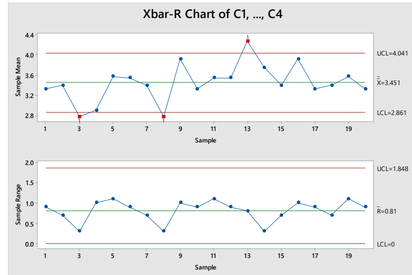

Fig. 2: Control chart for shaft diameter

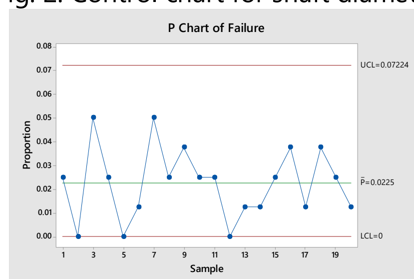

Fig. 3: Control chart (p-type) for the data set

VI. CONCLUSION

In this paper, the most effective way of quality control and productivity improvement has tried to find by experimenting on a manufacturing company. Using all quality tools and sampling plan is an expensive procedure. For any industry, using the control chart is the best way for quality testing. Cause and effect diagram, histogram are used to determine the cause and effect of production process. Acceptance sampling is used to determine the errors in control chart.

Statistical process control is a powerful tool to achieving sigma level. The following improved tools used in shaft manufacturing can be used in any industry to achieve their desired level of quality and productivity.

There are several approaches to choose from when the goal is to increase the quality and productivity of a shaft manufacturing company. The techniques used in this thesis have been limited due to insufficient time and resources. In this work only the quality tools have been used and tried to find the most effective way of quality testing and improving productivity. These have given a better solution. But if any one uses other technique of industrial engineering then he will get more fit. If it is decided to use the data in future studies it would be interesting. By this way it may be possible to specify high quality and productivity. For higher quality and productivity will never stop and the project extreme shaft manufacturing will proceed. An important suggestion for future work is to test if the findings are applicable to other products and machines within the factory. A deeper understanding could possibly make the conclusions from this study more understandable and easier to apply to other products.

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] [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] Anujkumar, 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, KinjalSuthar, "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] SurajDhondiramPatil, M MGanganallimath, Roopa B Math, YamanappaKarigar, "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] PatilSachin S., NaikGirish 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] RohitChandel, 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] DarshanaKishorbhai 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.