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IMPROVING QUALITY AND REDUCING REJECTS IN THE PRODUCTION LINE VIA POKA-YOKE TECHNIQUES

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ABSTRACT
In the current era of competition, any organization has to produce quality products that are free from defect at the cost of optimum. New culture of total productive management, total quality management in manufacturing and services sector produced new methods for ensuring quality of product. Applying some tools of TQM such as KAIZEN, Six Sigma, JIT, JIDCO, POKA YOKE, FMS etc., organization is planned to establish culture of quality. During actual production of any product there are too many repetitive and mundane steps which are performed by operators. These mundane work operations lead to mental fatigue and boredom in work which eventually lead to silly operator mistakes and we know that human is error-prone even if he doesn't want it. To prevent these silly mistakes, poka yoke concept play critical role. By applying some simple solutions we can prevent errors. Long term success of poka yoke provides output of saving time and we free the work pressure from mind of worker. We can utilize creativity and special skills of workers for more creative operations rather than putting more pressure for monotonous works.

Keywords:
Lean Manfacturing, Process Improvement, Quality Control, POKA-YOKE, Mistake Proofing, Defect Reduction.

INTRODUCTION

Today, every single company desires profit, high productivity, value in the market. There are defect reduction targets' slogans in most of the factories, but the final goal should always remain zero defects. "POKA-YOKE" is a crucial element in defect removal. Poka-yoke is a total quality management concept that is associated with limiting errors at source itself. Poka-yoke is associated with "fool-proofing" or "mistake-proofing.". A poka-yoke is any idea creation or mechanism design in a total productive management process which assists operator to prevent (yokeru) errors (poka). Principal objective of Poka Yoke concept is to make entire system error proof which means no body can commit mistake though some one desires to make mistake sin tentionally. It removes the defects or faults. This word was invented by Shigeo Shingo during 1960sfor Toyota Production System part. The purpose of Poka-yoke is to make the process in such a way that errors are discovered and removed at once, getting rid of defects at their origin. A systematic process to develop Poka-Yoke countermeasures which involves three-step risk analysis to be controlled.

OBJECTIVES

To analyze the effect of implementation of poka-yoke towards enhancing the performance of operations in assembly line. To analyze the effect of implementation of poka-yoke in minimizing the rate of rejection. To analyze the enhancement of productivity while operating the poka-yoke system. To compare and recommend the area of implementation of poka-yoke system for different process.

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WHAT IS POKA-YOKE

Poke-yoke (Mistake proofing) refers to the Japanese strategy of not just improving, but mistake-proofing in order to avoid defects (or Nonconformities) occurring in manufacturing operations. Poka-yoke is a preventive measure that aims at identification and removal of the special causes of variation in production processes, inevitably resulting in product defects or nonconformities. This was originally referred to as Idiot Proofing but it was realized that this name could hurt workers so the term Mistake Proofing was coined by Shigeo Shingo. Poka-yoke provides a policy and approach for preventing defects at the source. Poka-yoke solutions are not only inexpensive but also simple to comprehend and implement. Mistake proofing is one of the valuable tools to incorporate into any organization's Continuous improvement.

NEED OF POKA-YOKE

When any company resolves to do the lean manufacturing then one of the aims is to minimize scrap because no one wants to pay for additional inventory due to scrap. According to lean manufacturing philosophy it emphasizes speed of production and productivity too. To keep pace with this philosophy of speed we must overcome defects and rework. To the profit percentage increase the cost pressures always prove to be headache for top management therefore they never tolerate ongoing errors like scrap, rework, lateness etc. rather they are looking to achieve value of zero in this area.

TECHNICAL ASPECT OF POKA-YOKE METHOD

Poka-Yoke method can be used to prevent causes, which will lead to next time errors and to perform low-cost control whether to accept or not the product. It is not always 100% probability removal of all errors. in such instances it is the work of Poka-Yoke methods is detection as early as possible. Examine the process of defects formation of the product observed that between an error caused by the defect is still one, the possible possibility.

METHODS OF OBTAINING POKA YOKE

Poka yoke ideas are easy to be creative in operation and invention. Shingo says, "Defects will never be reduced if the workers involved do not modify operating methods when defects occur." Below are some of the easy ideas (tips) for avoiding errors: poka-yoke devices are easy and cost-effective. They comprise electronic devices that will not initiate the assembly process until the appropriate part has been fitted into the appropriate position as well as measures like altering the shape of the part or the fixture so that things could fit together only in the right.

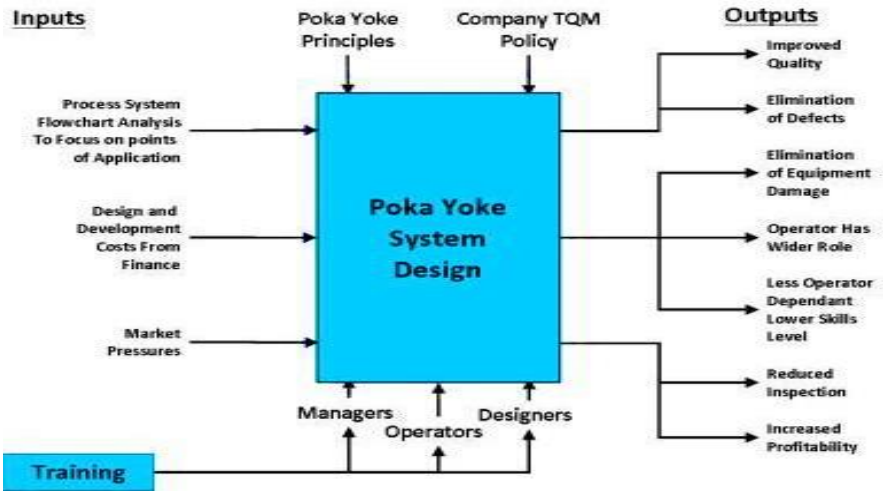

Figure 1 Poka-Yoke System design

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Rejection Rate			
Before implementation of poka yoke		After implementation of poka yoke	
Month & Year	No. of rejections	Month & Year	No. of rejections
June 2023	28	Jan 2024	0
July 2023	12	Feb 2024	0
Aug 2023	54	Mar 2024	0
Sept 2023	24	Apr 2024	0
Oct 2023	37	May 2024	0
Nov 2023	56	June 2024	0
Dec 2023	55		

Table 1 Rejection rate before and after implementation of Poka Yoke

Production Rate			
Before Implementation of Poka Yoke		After Implementation of Poka Yoke	
Month & Year	Production	Month & Year	Production
June 2023	41054	January 2024	46504
July 2023	45894	February 2024	48757
August 2023	41879	March 2024	49422
September 2023	45980	April 2024	54935
October 2023	32345	May 2024	37745
November 2023	44908	June 2024	56789
December 2023	50367		

Table 2: Production rate before and after implementation of Poka Yoke

RESULT AND DISCUSSION

The outcome of this project proves the efficiency of poka-yoke methods in minimizing flaws, increasing efficiency, and promoting quality in a manufacturing line. The 66.7% reduction in flaws and 25% reduction in cycle time are ample gains that can contribute significantly to the bottom line of the organization. The use of poka-yoke methods also led to an 18.75% increase in first-pass yield, which means that the production line is delivering higher-quality products with fewer defects. These findings are in line with the literature on poka-yoke methods, which indicates that these methods can be used to minimize defects and enhance quality in manufacturing processes.

CONCLUSION

Management procedures, their assessment, monitoring and enhancement are best supported by the eight basic principles of quality management and quality: methods, tools and techniques. The objective of Poka-Yoke is to eliminate or reduce human errors in manufacturing processes and management due to mental and physical human

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fallibilities. For the most part, it is to eliminate errors on its own. The central concept of this approach is prevention of causes, which can lead to mistakes and employ comparatively inexpensive control systems to determine conformance of the product with the model. With this project, the significance of Poka Yoke in the maintenance of company quality was well understood. The company horns that are applying Poka Yoke for their production have 100% efficiency to lower the rates of rejection. The research on Poka Yoke has assisted in the understanding of the methods of eradicating errors from the source itself and prior to occurrence.

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