

## Using Poka -Yoke for the Development of SMEs

Mr. Sujay Biswas<sup>1</sup>, Dr. Abhijit Chakraborty<sup>2</sup>

<sup>1</sup>Lecturer & In-charge, Dept. of Mechanical Engineering, Technique Polytechnic Institute, West Bengal, India

<sup>2</sup>Principal, Technique Polytechnic Institute, West Bengal, India

**ABSTRACT:** This paper represents the utilization of Poka – Yoke for the development of SMEs. The concept of Poka – Yoke was first coined by Japanese people to avoid unintentional mistake in the manufacturing enterprises. The aim of Poka-Yoke in the practical examples is to eliminate or minimize human error in manufacturing process and management as a result of mental and physical human imperfections. It is a total quality management tool which is related to restricting errors at source itself. By using the tool the producer can achieve the expected level of goal through elimination of rejected products.

**Keywords:** Errors, Mistake, Producer, Quality, Restricting

### I. INTRODUCTION

The term “Poka-Yoke” has been derived from the Japanese words Poka (unintentional mistake that one can make) and Yoke (to prove or prevent). It was developed by Shigeo Shingo in the 1960s. Poka-Yoke has two basic functions like- control and warning. The main aim of Poka-Yoke is to frame process so that mistakes are impossible or easily can be detected and corrected and also to eliminate or reduce the human errors in manufacturing processes and in management system due to mental and physical human imperfections. Every manufacturing enterprise wants to achieve higher profit. To reach that level of perfection of product is essential. The Small Manufacturing Enterprises act as vendors for the companies. More perfection of work is required in the SMEs. Since, the tool Poka – Yoke can be used there to eliminate mistakes in the SMEs.

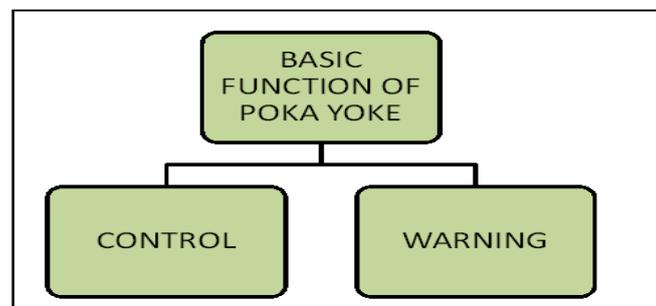


Fig. 1

### II. LITERATURE REVIEW

Poka-yoke is a technique for avoiding simple human error in the workplace also known as mistake-proofing, goof proofing. Poka-Yoke is simply a system designed to prevent inadvertent errors made by workers performing a process. The aim of Poka-Yoke method is to eliminate or minimize human errors in manufacturing processes and management as a result of mental and physical human imperfections. Inadequate information, unawareness, wrong assumptions, and lack of knowledge, along-side other organizational and motivational factors, are also identified as contributory factors to defects at the design stage. Construction defects are always the key concern of the construction industry. Different constructed facilities generate different types of defects and demand different levels and types of quality, depending on the functions, system types, and materials used. Once a defect occurs, and it is rectified then this can be known as rework, which is defined as the unnecessary effort of redoing an activity or process that was incorrectly implemented in the first time. Poka-Yoke method was introduced by Shigeo Shingo in 1961, when he was one of engineers at Toyota Motor Corporation. This method, in other words, is to prevent defects and errors originating in the mistake. Shigeo Shingo being an advocate of statistical process control systems in Japanese companies realizes that such a solution would never

improve the manufacturing process. It is , therefore, started in Japanese organizations to implement a Zero Quality Control (ZQC). One of its element implementing the principle ZQC is just Poka- Yoke method. Managers of sheltered work centers can also of ordinary companies, can realize about the great potential of Poka-Yoke as an easy means of flexibility and accessibility (Miralles C, HoltR, Marin-Garcia A, Canor-Daros L). One cannot prevent all mistakes, but can make it easier to do the job right, although mistake will still happen. Instead of allowing processes to continue after a mistake has been made, Poka-Yoke could be used to stop them (Shahin A., Ghasemaghaei M.).

**III. APPROACH FOR POKA-YOKE**

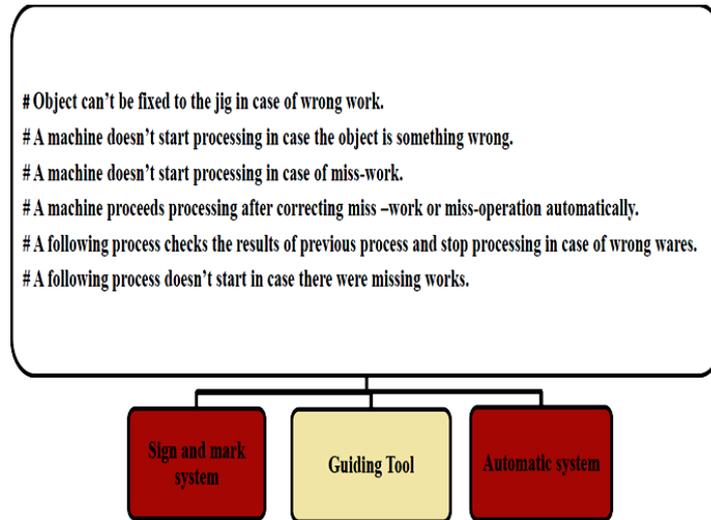


Fig. 2

**IV. MECHANISM OF POKA – YOKE**

When the product is being produced, the defective products are produced. To minimize the number of defective products, during production at the first stage of defective product at any particular machine it is to be detected. Then the concerned personal will predict the situation and defective root cause of the same.

Further one has to go to avoid abnormality by controlling wrong operation and alarm system is to be created. If the product produced is beyond the tolerance range, it is of no use to stop that product to move further in the production process. This will in turn control the flow.

Thus a control mechanism will be developed by alarm and stop the production of the defective product further.

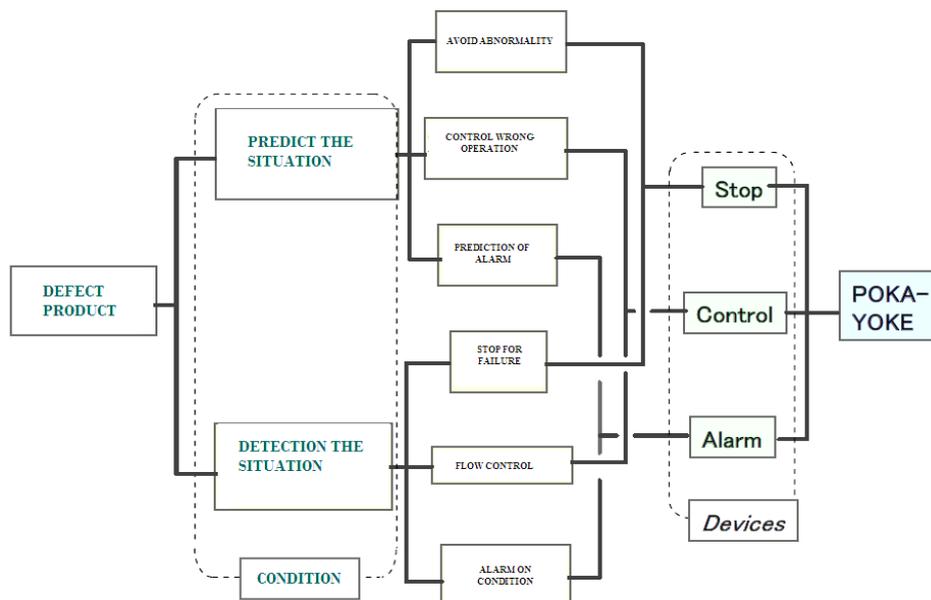


Fig.3. Mechanism of Poka – Yoke

## V. CASE STUDY

XYZ is an air duct manufacturing enterprise, located in the district of Hooghly in India. Manufacturing of Air duct is done through blow moulding technology. After blow moulding process, it requires to remove excess material. Currently, Material removal process is done manually. Workers remove the excess material with sharp knife. Removal process is totally depends on workers skillness, there are high chances of improper removal of material which rejects material. Past rejection data is also very high due to manual removal (Human Error). The problem requires to be attended with high priority and it is very important to reduce rejection because it affects company's reputation and cost as well. The human error elimination is required in such a way that it eliminates the error.

## VI. METHODOLOGY

At first, the Small Manufacturing Enterprises units have been observed. Thereafter, a particular operation of the SME is observed minutely. The past record of product rejection is observed. The skillness of the worker is noted and the interaction with the hierarchy of the production unit is also done. In this way, the main cause of mistake-proofing is analyzed for the SMEs.

## VII. ANALYSIS

Product defect is due to

- (i) No proper record is kept of the defective products.
- (ii) The statistical interpretation and trend analysis is not done.
- (iii) Negligence on the part of concerned personals to find the root cause of the defect.
- (iv) The control over incorrect operation is not present.
- (v) Inadequate flow control is present.
- (vi) No alarming system is there when at first the wrong operation is done on the product.

## VIII. PROPOSED MODEL

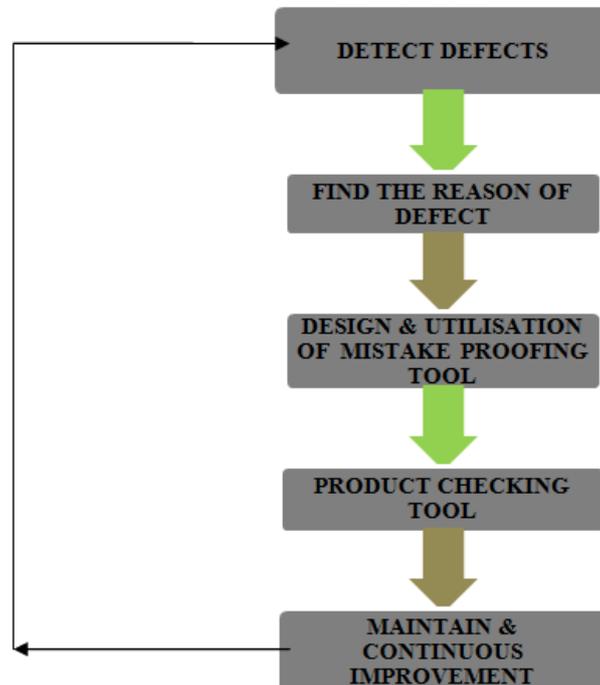


Fig. 4. Proposed Model of Poka - Yoke

The defect is to be identified at the first stage of the production process. Further operation is wastage of inventory, time and finance in that aspect. Top most priority to detect the defects. Then to find the cause of that defect may be due to bad quality of material or improper way of handling the machine or lack of knowledge on the part of production personal in that regard. One has to go for designing a system and utilization of mistake proofing tool. After that product checking tool is to be applied in the production system. This aforementioned procedure is to be mentioned and the product will go for continuous improvement.

## IX. CONCLUSION

As SMEs are working as vendor for big companies so any defective product is going to affect the MNCs. In addition to that the loss to be incurred due to mistake in the production process is going to affect them very much financially. SMEs are therefore at the utmost need of applying Poka Yoke, at the first stage of defective production. We have to apply control mechanism by the help of alarm system so that the further production is not going to be continued for that defective product. In addition to that the root cause of the problem is to be addressed this can be possible only when microscopic approach is applied while producing the product. This will in turn result in the upliftment of the quality of the product and minimises the percentage of rejection as well as the waste.

## REFERENCES

- [1] A. Sunyoto and T. Minato. Representing casual mechanism of defective designs: A system approach considering human errors. *Constr. Manage. Econom.*, 21(3), 2003, pp 297–305.
- [2] H. Wachajczyk, M. Dudek-Burlikowska, Quality continuous improvement of company with usage the Poka-Yoke methods, *PSKN* 7/2006, 57-64, (in Polish).
- [3] J. Ketola, K. Roberts, Demystifying ISO 9001:2000 – part 2, „Quality Progress”, 34/10 (2001).
- [4] M. Dudek-Burlikowska, D. Szewieczek, The Poka-Yoke method as an improving quality tool of operations in the process., *Journal of Achievements in Materials and Manufacturing Engineering*, 36/12009, pp 95-102.
- [5] Miralles C, Holt R, Marin-Garcia A, Canor-Daros L. 2005, “Six sigma in small-and medium-sized UK manufacturing enterprises”, *International Journal of Quality & Reliability Management*, vol. 22, no. 8, pp. 860-874.
- [6] Navin Laxmanrao Potey, Ajay S. Bonde, Process Improvement through Poka- Yoke technique- A case study., *VSRD International Journal of Mechanical, Civil, Automobile and Production Engineering*, Vol. 3 No. 6 June 2013, pp 167-171.
- [7] P. E. D. Love. Influence of project type and procurement method on rework costs in building construction projects. *J. Constr. Eng. Manage.*, 1281, 2002, pp. 18–29.
- [8] Shahin A., Ghasemaghaei M, An architecture for management of explicit knowledge applied to product development process, *CIRP Annals* 51/1(2002), PP. 413-416.