Process Improvement by Poka-Yoke : A Tool for Zero Defects

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Abstract
Every Organization aims to the "zero defects" philosophy which establishes zero error as a goal. This cannot be achieved overnight but can be approached over time by continuosly striving for the increased quality by reducing the errors. So it remains a question in our minds that what kind of techniques are to be adopted to assure zero defects? Poka-Yoke, is one of tool that can be used to achieve manufacturing with zero defects and it has the potential to support the implementation of DMAIC phases of Six Sigma. DMAIC stands for define, measure, analyse, improve and control phases. Several survey & researches were studied by referring to the relevant research papers on applying Poka-Yoke concept in DMAIC phases. It has been pointed out that the Poka-Yoke solutions suggested in these research papers were not actually implemented in real-time scenario. Hence, our research paper is concluded with a suggestion that prospective researchers in several areas can make more efforts to actually implement Poka-Yoke technique in DMAIC phases for achieving the goals of Six Sigma.

Keywords: *Six Sigma, Poka yoke, Zero defects, Quality control & DMAIC.*

Introduction

The concept of six sigma has s faced a fair degree of criticism, with some arguing that a state of zero defects simply cannot exist. Others have worked hard to prove that "zero defects" in quality management doesn't literally mean perfection, but rather refers to a state where waste is eliminated and defects are reduced. It means ensuring the high quality standards in different projects or processes undertaken.

What do we Mean by Zero Defects?

From a literal standpoint, it's pretty obvious that attaining zero defects is technically not possible in any sizable or complex manufacturing project.

Zero defects theory ensures that there is no waste existing in a project. Waste refers to all unproductive processes whether we talk about tools, employees, material and so on. Anything that is non-productive and reduces the value of our project must be eliminated. Eliminating waste creates a process of improvement and correspondingly lowers costs of different processes.

Conceptually and fundamentally Zero defects and Six Sigma walk different lines. Here is a quick summary of their comparisons –

1. Zero defects, focus on prevention of defects while Six Sigma focuses on managing the defects.
2. In this approach, the employees are not given special training programs as the main focus is on delivering just the usual training. Six Sigma stresses upon the extensive training

imparted especially for the support of the staff which is usually non productive.
3. Zero defects works on the concept of having no defects whatsoever, which happens when someone works right the first time and every time thereafter.
4. Zero defects, has a very high performance standard as it does not accept any defects at all. Having such a strategy could be highly beneficial for a company, but is practically impossible in the current scenario to realize.
5. Zero defects motivates each employee to get involved to identify and fix the possible reasons for defects but the same cannot be said for the Six Sigma approach.

Objective

The motive of this paper is to study how Poka-Yoke method removes or reduces the human error in manufacturing processes. So there is a connection or relationship between Poka-Yoke method and Six sigma.

Literature Review

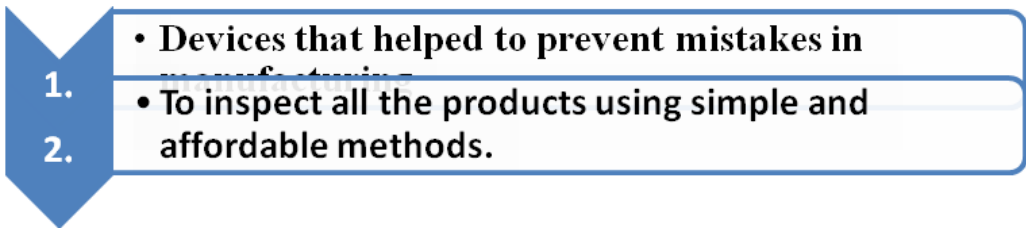
Evans, J.R. and Lindsay W. M. (2008) have discussed about the management and quality control methods.S. Tkaczyk, M. Dudek(2009) have studied that in the present time the organizations must implement quality tools, techniques, methods which support the prevention strategy and must pay attention to improving each element. P.S. Pande, R.R. Neuman, R.R. Cayanagh(2003) gave a relationship between PDCA Cycle and pokeayoke.H. àachajczyk, M. Dudek-Burlikowska discussed the Quality continuous improvement of company with usage the Poka-Yoke methods.Burlikowska, D. Szewieczek(2009) said that Poka-Yoke method is an improving quality tool of operations in the process in an organisation. Stewart Anderson(2002) studied the Poka-Yoke method as a preventive method in mistake proofing.

Poke Yoke: A Tool for Zero Defects

With billions invested in manufacturing across the world and a lot of talk about Quality Assurance, there is immense focus on what goes on at the production floor space. 'Statistical Quality Control (SQC)', 'total Quality Management', 'Zero Defects' and techniques for Inspection focus on similar issues: How to reduce the number of errors? How to prevent defects? How to aim for Zero Defects? How to avoid mistakes?

'Poka Yoke', is a Japanese term which means 'mistake proofing' and was developed by Shigeo Shingo, a Japanese engineer, who came with a concept of Zero Quality Control (ZQC).

His approach relied upon



The most significant contribution of Poke Yoke is in manufacturing industries. We must understand that when any company manufactures a product whether it is a toy, shoes, eatables, electronic goods, it has to avoid the defective products from reaching the prospective consumer. In this era of information, technology and competition, a manufacturer can no longer take his consumer for granted. He has to give the best quality and keep up to the standards that he promises. If a consumer is not happy with the product then word of mouth plays a very important role in distorting the brand image. But, if he is happy, it will be easy to retain him. He will give a positive response to his friends as well.

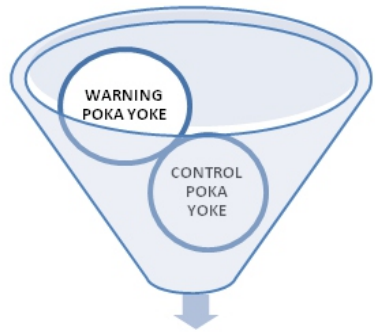
So, how does a manufacturer apply common sense to manufacturing to make the number of defectives/errors less than before? Or, rather how can he delight his consumer by making a product that serves him well.Over a period of time, many products have evolved to serve the same function more efficiently.

Following is a list of mistake proofing as applied to our everyday lives to avoid mistakes, reduce cost and live efficiently. Thus the products which have been changed a little for a lot more benefit are as follows:

- Sensors in urinals and wash sinks detect when water is to be turned off. This eliminates the problem of wastage of water at public restrooms.
- Timer based Lighting systems that turn off automatically after the duration set on the timer reaches its mark. This acts as an electricity savor in washrooms, laundry rooms, etc
- While smoke alarms inform about a potential hazard, doors near a library/departmental stores can beep off if the materials are not checked out in the correct order. This reduces risks and makes sure that people check out borrowed/purchased materials properly.

Types of Poka Yoke

Poka-yoke is based on prediction and detection. Consequently, there are two basic types of poka-yoke systems.



TYPES OF POKA YOKE

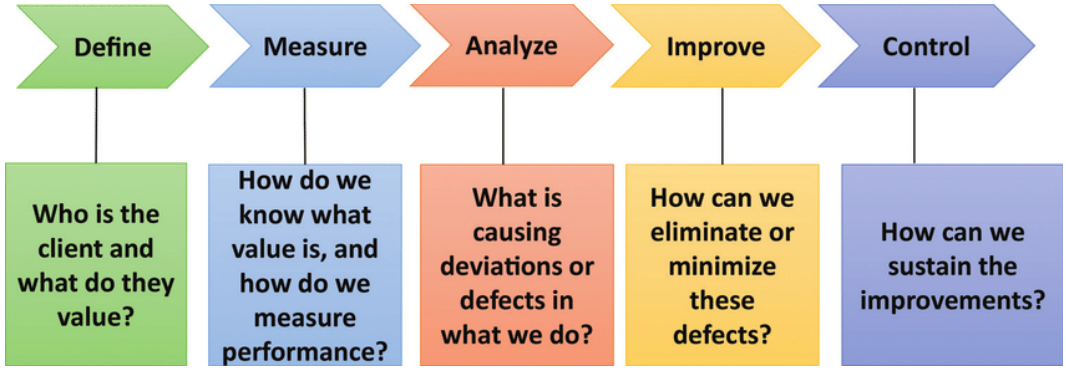
a) **Control Poka Yoke:**The control poka-yoke does not allow a process to begin or continue after an error has occurred. For example, a part on a machine may be equipped with a sensor that will not allow the process to continue unless the part is properly implanted.

b) **Warning Poka Yoke:** A second type of poka-yoke provides some type of warning when an

error occurs. This does not prevent the error, but immediately stops the process when an error is detected. It is useful for mass production environments with fast processing as the device prevents mass production of scrap.

Poka-Yoke Concept in Dmaic Phases

DMAIC is the problem-solving method behind Six Sigma. It consists of five Phases:



Define: What problem is to be fixed?

The Define Phase is the very first phase of the Six Sigma improvement process. In this phase the expert team creates a high-level blueprint of the process and begins to understand the need of the customers of the process. This is the most important phase in which the team frames the project focus for themselves and the leadership for the organization.

Measure: How will the process perform?

As the team starts collecting data they focus on both the procedure as well as measuring what customers want. That means initially there are two motives: reducing the lead time and improving quality.

Analyze: What is the cause of problem?

This phase is not given much attention which can cause new problems. The idea is to brainstorm main root causes (and not solutions), develop hypotheses based upon that as to why problems exist and then work to prove or disapprove their hypotheses.

Improve: How will the team investigate the main causes of the problem?

Once the project teams have determined the root causes it's time to develop solutions. The Improvement Phase is where the expert team come with the new solutions and collects data for improvement.

Control: How to sustain the improvement?

When the process problem is once fixed the team must make sure that the process maintains its gains. Here the team lays stress on creating a control Plan to continue measuring the success of the process and develop a Response Plan in case there is a downfall in the performance.

Conclusion

Each organization having implemented a Total quality management system and also plans for creating the quality processes and the finished products with zero errors. There can be some difficulties in implementing Poka yoke but we have to avoid all in order to achieve our aim of " Zero Defects ". Thus Poka yoke aims for productivity of system with high quality products at minimum cost.

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