POKA YOKE – A TOOL FOR COMPETITIVENESS IN DIE PRODUCTION SYSTEMS

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Abstract*. Currently companies act on a global market. To survive in this market is important to be competitive. The company competitiveness is measured by the levels of performance by making competitiveness products with minimal costs. To control and decrease the costs must make through continuous improvements of the process. A tool that helps to do that is Poka Yoke devices. Poka Yoke is a tool of lean concept, used across processes. Its purpose is to eliminate product defects by preventing, correcting, or drawing attention to human errors as they occur. Poka Yoke devices don't have to be expensive and they are usually very simple. It helps to preventing mistakes before they occur and is the best way to reduce failures and waste, resulting in lowered costs. Poka Yoke helps the company to increase the value added of the product and to follow the road of zero defects.*

Key words: *Lean concept, Poka Yoke, competitiveness, production system, cost reduction, continuous improve.*

1. INTRODUCTION

In present, because of globalization and under cries effect, the system productions are under intense pressure to find new ways to dramatically reduce costs and improve return on invested capital while better serving their more demanding customers.

To accomplish these goals, many production systems implemented the Lean philosophy that espouses the elimination of all forms of waste, continuous improvement, and simplification of business processes.

For the system productions successfully adopting Lean, the motives are to provide superior value to the customer while at the same time improves profitability.

2. LEAN CONCEPT

Lean manufacturing has been a symbol of efficiency and optimal performance since the 1980's, mainly due to its association with the automotive industry and Toyota.

As lean thinking continues to spread to every country in the world, leaders are also adapting the tools and principles beyond manufacturing, to logistics and distribution, services, retail, healthcare, construction, maintenance, and even government. Indeed, lean consciousness and methods are only beginning to take root among senior managers and leaders in all sectors today [1].

The five principles of Lean presented in Lean Thinking are: value, value stream, flow, pull, and perfection.

Literature refers to Lean manufacturing also as "Just-in-time" (JIT), or as "cellular manufacturing" (CM). These terms are often used interchangeably, and the philosophy they describe is the same:

- elimination of waste;
- maximization of efficiency;
- continuous improvement.

A tool use to elimination waste is Poka Yoke concept.

Poke Yoke is a critical component of Lean manufacturing. Simplifying processes, reducing errors, associated waste and costs brings value to operations. In turn, customers who benefit from more efficient manufacturing and less downtime view value-added suppliers as "partners" rather than just interchangeable vendors. Poka Yoke is fool

proofing, which is the basis of the Zero Quality Control (ZQC) approach, which is a technique for avoiding and eliminating mistakes [2, 3].

3. POKA YOKE DEFINITION

Poka Yoke is Japanese term which means mistake proofing. Poka Yoke was coined in Japan during the 1960's by Shigeo Shingo who was one of the industrial engineers at Toyota.

Poka Yoke is a technique for avoiding simple human error in the workplace. Also known as mistake-proofing, goof-proofing, and fail-safe work methods, Poka Yoke are simply a system designed to prevent inadvertent errors made by workers performing a process [4].

A Poka Yoke device is one that prevents incorrect parts from being made or assembled, or easily identifies a flaw or error. Poka Yoke, a means of providing a visual or other signal to indicate a characteristic state. Is a manufacturing technique of preventing errors by designing the manufacturing process, equipment, and tools so that an operation literally cannot be performed incorrectly.

4. CATEGORIES OF POKA YOKE DEVICES

Poka Yoke devices fall into two major categories: prevention and detection.

Prevention gives 100% of the guarantee of good products. It is not possible to produce defective product. Example: The equipment used for the passing elements; element is to be given the party which should be assembled, so that an operator shall not lose time for thinking how it should be fitted, the risk of confusion also was minimized [3].

A detection device signals the user when a mistake has been made, so that the user can quickly correct the problem. The small dish used at the Yamada Electric plant was a detection device; it alerted the worker when a spring had been forgotten. Detection devices typically warn the user of a problem, but they do not enforce the correction [5].

In system production activity from each day by both detection and prevention Poka Yoke devices, though we may not usually think of them as such.

Poka Yoke is an alert method that gives 30% of the guarantee of good products. This method informs about appearance of defect but does not provide and does not produce 100% quality. The most igniting the lamps or activating the alarm, which shall return the operator to rise to an error.

Types of Poka Yoke devices:

- The control gives 100% of the guarantee good products. The control ensures that if it was created defect, it's not coming outside the production line and does not reach to the customer [3].
- elimination: remove the possibility of error
- replacement: replacing an error-prone process with a mistake-proof process
- facilitation: making correct actions easier through mechanisms like color-coding
- detection: inspect product for agreement with standard, successive or self-check
- mitigation: allowing the mistake to occur but minimize the consequences (That's preventing the influence of mistakes) [6].

5. CHARACHTERISTICS OF POKA YOKE DEVICES

Good Poka Yoke devices, regardless of their implementation, share many common characteristics:

- they are simple, cheap and easy to implemented. If they are too complicated or expensive, their use will not be cost-effective;
- they are part of the process, implementing what Shingo calls "100%" inspection, it's not an new operation. Prevent the ability to make a defect / prevent the defect from being passed on;
- they are placed close to where the mistakes occur, providing immediate feedback to the workers so that the mistakes can be corrected.

6. IMPLEMENTED POKA YOKE IN A DIU PRODUCTION SYSTEM

A. Steps for implement PY

- develop team;
- create Error Proofing Implementation Sheet;
- identify and describe defect;
- determine location the defect was found & made;
- identify root cause;
- current process and deviations from standards;
- propose and implement improved process;
- measure;
- standardize.

The generator mechanism to create a Poka Yoke can see in figure 1 [7].

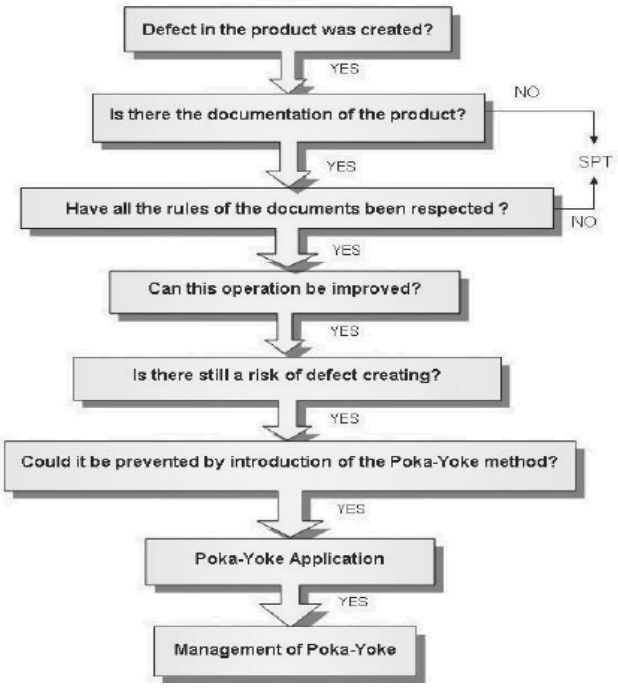

Fig. 1 The generator mechanism to create a Poka Yoke

B. Examples of Poka Yoke in a die production system

Judged by these criteria, the "small dish" solution to the missing-spring problem is an excellent Poka Yoke device can see in figure 2 [5].

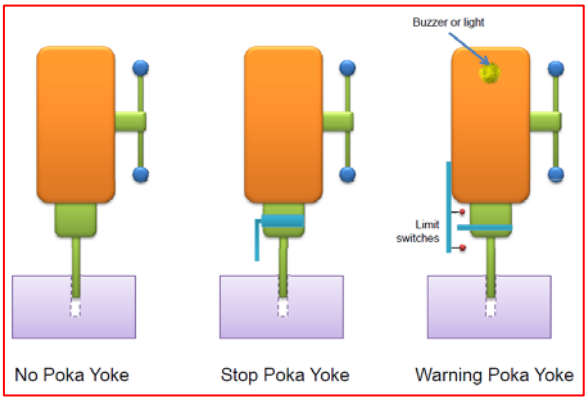

Fig. 2 Poka Yoke at the drill operation

It's a Poka Yoke device because:

- it was simple;
- it was cheap, involving only the cost of a small dish;
- it provided immediate feedback about the quality of the work; corrections could be made on the spot.

These Poka Yoke reducing rework because it's a:

- warning Poka Yoke: operator is alerted when a mistake is about to made;
- control Poka Yoke: the Poka Yoke device actually prevents the mistake from being mad.

Another Poka Yoke example is Bar-code scanning at the check-out lane to eliminate errors and increase speed or an automatic generating of labels.

If the label editing is done manually, the operator inputs the data character by character, the possibility of wrong testing exist.

A Poka Yoke is automatic generation of labels with a special program (in order of production-related).

The operator takes over from system the command and the remaining fields of the label are automatically generated.

The cost of Poka Yoke device can see in figure 3 [6].

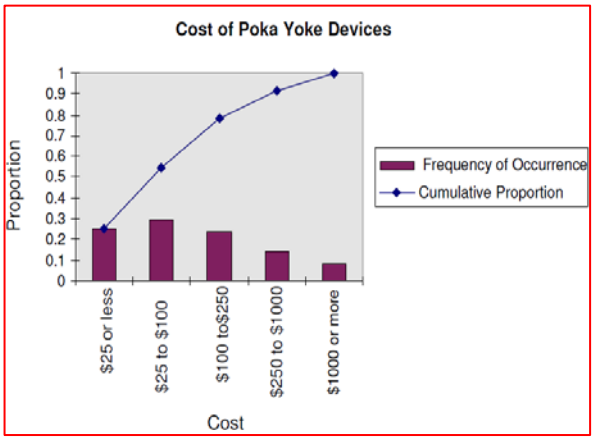

Fig. 3 The cost of Poka Yoke device

7. CONCLUSIONS

Poka Yoke shows how finding mistakes at a glance helps to avoid defects. 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. For the main part is to eliminate errors independent. The main idea of this method is preventing causes, which may result in errors and use relatively cheap control system for determining compliance of the product with the model. It is a simple principle that can be implemented by anyone at any time, and can lead to massive savings in both time and money.

Poka Yoke is at its best when it prevents mistakes, not when it merely catches them. Since human errors usually stem from people who get distracted, tired, confused or demotivated, a good Poka Yoke solution is one that requires no attention from the operator. Such a Poka Yoke device will prevent the occurrence of mistake even if the operator loses focus in what they are doing.

In the described organizations Poka-Yoke method in connecting with the quality methods ensure of high quality of produced engine elements, as well as by the continuous monitoring process all allow to minimize cost, and sharing not great effort to improve.

Use of Poka-Yoke requires strong basis in the overall quality management. Necessary are clear indications to distinguish between a defective and correct product and therefore company regularly carry out training crew. The method Poka Yoke requires an immediate reaction and the correction as well as a result in the operation. Errors arise from various reasons, but most of them can be prevented if only people are be able to identify the problem at the time of formation, define the causes and make appropriate corrective steps. Prevention of defects in the process before their appearance is the best way of defects reduction and thus reduces the costs. References

It's important to use Poka Yoke in a die production system because:

- it helps people and processes work right the first time;
- it stresses on techniques that can drive defects out of products and process and thus make it impossible to make mistakes. This substantially improves quality and reliability;
- the use of simple Poka Yoke ideas and methods in product and process design can eliminate both human and mechanical errors;
- Poka Yoke does not need to be costly.

Using Poka Yoke has a lot of benefits for die production system:

- enhanced productivity;
- the highest level of quality can be achieved;
- lowers quality cost;
- lowers rework;
- enhanced customer satisfaction.

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