



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**POKA YOKE JIG IMPLEMENTATION TO IMPROVE
PRODUCTIVITY AT MANUFACTURING INDUSTRY**

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor's Degree in Manufacturing Engineering Technology (Process & Technology) (Hons.)

by

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This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Engineering Technology (Department of Manufacturing Engineering Technology) (Hons.). The member of the supervisory is as follow:

.....

(Project Supervisor)

DECLARATION

I hereby, declared this report entitled “Poke Yoke Jig implementation to improve productivity at manufacturing industry” is the results of my own research except as cited in references.

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DEDICATION

To my beloved parents

ACKNOWLEDGEMENT

Firstly, I would like to express my gratitude to the Almighty Allah s.w.t for giving me this opportunity to finish my PSM project.

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ABSTRAK

Projek ini bertajuk "Poka Yoke jig bagi meningkatkan produktiviti kepada industri pembuatan". Proses poka yoke ini juga mengelakkan masalah yang terdapat dalam proses pembuatan antaranya kesalahan pemasangan, kesalahan proses, kehilangan barang, kesilapan pemasangan bahagian yang salah dan kesalahan bahagian yang bercampur (bendasing). Objektif projek ini adalah meningkatkan produktiviti menggunakan Poka Yoke semasa proses pemasangan dilakukan dan mengurangkan jumlah kerja semula. Kaedah untuk melakukan projek ini adalah bermula daripada pemilihan tajuk yang sesuai, kajian literatur, mengenalpasti masalah, pemilihan kilang, menyelesaikan masalah, mereka bentuk Poka Yoke, analisis hasil, akhir sekali cadangan dan kesimpulan. Projek ini menggunakan pemilihan konsep, terdapat 3 jenis bentuk jig yang dicadangkan dan akhirnya hanya 1 yang terbaik dipilih. Hasil dapat dilihat dengan membandingkan jumlah kerja semula sebelum menggunakan Poka Yoke selama 3 bulan dan 1 bulan jumlah kerja semula selepas menggunakan Poka Yoke. Dan hasilnya menunjukkan pengurangan jumlah kerja semula selepas menggunakan Poka Yoke berbanding sebelum menggunakan Poka Yoke. Terdapat cadangan yang boleh diambil untuk projek ini antaranya dari segi bahan membuat Jig yang lebih ringan. Kesimpulannya objektif projek ini tercapai iaitu meningkatkan produktiviti menggunakan Poka Yoke semasa proses pemasangan dilakukan dan mengurangkan jumlah kerja semula.

ABSTRACT

The title of this project “Poka Yoke jig implementation to improve productivity at manufacturing industry”, Poka Yoke process function is to avoid problems during manufacturing process like error set up error, processing error, missing part. Improper part, operation error and mixed part. The objective this project to improve production by using Poka Yoke during process assembly and to reduce rework during mass production. The method for doing this project is starting from the title selection, literature review, define problems, select company, troubleshoot, design jig, result analysis, finally recommendations and conclusions. This project used the concept selection, there are three types of jigs proposed and eventually only one of the best choiced. Results can be seen by comparing the amount of rework before using Poka Yoke for 3 months and 1 month after the amount of rework using Poka Yoke. And the results showed a reduction in the amount of rework after using Poka Yoke Poka Yoke than ever before using. There are suggestions that can be taken for this project in terms of the material make them lighter Jig. Conclusion, the objective of this project is to improve production by using Poka Yoke during process assembly and to reduce rework during mass production.

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CHAPTER 1

INTRODUCTION

In this study, as we know in our daily life of every human being, especially in the industrial field must have made a mistake and this is the main cause of the poke yoke system is have in industry. It was a Japanese manufacturing engineer named Shigeo Shingo in the 1960s. who developed the concept that revolutionized the quality profession in Japan. Originally called “fool proofing” and later changed to “mistake proofing” or “error proofing” to avoid offending employees.

1.1 Background of the study

Poka Yoke is simply a system designed to prevent inadvertent errors made by workers performing a process from becoming defects / non-conformances and ultimately incidents. Poka-Yoke is one of the simplest tools to master; it's very consistent with the fundamental aims and philosophy of Six Sigma, and it has wide applicability in manufacturing, engineering, and transactional processes. Poke-Yoke involves creating actions that are designed to eliminate errors, mistakes, or defects in everyday activities and processes. Poka-Yoke starts with an understanding of the cause-and-effect relationship of a defect, followed by a remedy that eliminates the occurrence of the mistakes that lead to that defect.

This project focuses on poke yoke on process jig when do process assemble. The most common application for our jigs is high quality assembly jigs and tools provide repeatability, accuracy, and interchangeability also in the manual manufacturing.

1.2 Problem Statement

Poka Yoke may be used where ever something can be incorrect or even a mistake could be created. This is a method, device which can be put on any kind of procedure whether it is that manufactures. Error are many types.

The type error in processing is omitted Processing, this process is happen because step in process not carried out. Example situation hole is not drilled, part not cleaned and other type of error is processing errors is a steps in process carried out incorrectly example when do the hole at surface , hole drilled in wrong place.

The type error in material is missing material and example situation form not filled out completely, screw left out and order not complete. Futhermore, the type of error is wrong material and example type of error is wrong information supplied, wrong scre used and wrong form filled out.

Poka Yoke is an easy however efficient method of decreasing mistakes as well as problems in production procedure by removing the opportunity to make the mistake in the first place; it eliminates the need for particular concentration or skill or memory to get the process right.

This project do at Likom company. This company have a many department, such as assembly department. This department have a problem about product rework, and this problem is almost happened when the product is running in production. This problem is happened when do the assembly to product (xyratex). Xyratex is a product as the divisor in central processing unit (CPU). This product become a rework when the operator is missing to check this product (xyratex) is do the tapping or not by GO/NOGO pin in tapping process.

1.3 Objective

- 1) To improve production using by poke yoke during by process assembly
- 2) To reduce rework rate during mass production

1.4 Scope

This scope is happened in Likom company and the scope of this study is more focusing on how to apply the Poka Yoke jigs to checked tapping process based on a problem statement is happened when do the assembly process.

CHAPTER 2

LITERATURE REVIEW

This chapter introduces a literature review of implementation of poka yoke to improve productivity at manufacturing industry.

2.1 Poke – Yoke

The poka-yoke is one which stops wrong components through being created or even put together, or even very easily recognizes the downside or even mistake.

2.11 Overview of Poka-Yoke

Poka Yoke were originally developed for manufacturing, considered primarily physical devices to prevent mistakes from occurring. Nowadays the whole concept of Poka Yoke has a much more extensive purpose, it can be seen as tool, as an effective quality control technique and finally as a quality philosophy. The creator of Poka Yoke concept, Shigeo Shingo, believed that defects could simply be eliminated in the first place, instead of relying on measures taken on after the fact. According to Shingo (1986), mistakes that lead to defects can be engineered out of processes and

defects can be eliminated this way. The well known quality guru, Edward Deming, has once stated that “quality comes not from inspection, but from improvement of the process” (Manivannan, 2006). This statement is also the heart of Poka Yoke philosophy. Rather than looking for defects, a true goal is to create processes that yield zero defects (Manivannan, 2006)

Poka Yoke is a set of techniques for mistake proofing, used both to prevent defective products from being produced and to prevent production equipment from being set up incorrectly. Poka Yoke includes designing things so that they can be put together only one way, sensors to detect when things are not done correctly, and color coding to reduce the likelihood of connecting things incorrectly. Originally called baka-yoke or foolproofing, the term has been changed to Poka Yoke, mistake proofing, to avoid any suggestion that operators are fools. Poka Yoke is another lean technique attributed to Shingo. Recent research by (Manivannan, 2006) in its early days, the term poka yoke was known as baka-yoke, meaning fool proofing. In the operator of view, this term wasn't very attractive, because of terms have dishonorable and offensive connotation.

Poke yoke is one Japanese word meaning mistake proofing. Poka yoke in lean manufacturing process helps in the manufacturing process of a production operator avoid mistakes. Poka yoke is implemented by using simple objects like fixtures, jigs, warning devices and the like to prevent people from committing mistakes, even if they try to do. Recent research by (Manivannan, 2006) soon after the name episode in one of Japanese car manufacturing plants in 1963, the term describe this methodology was change to poka yoke. The term of poka yoke stand for mistake proofing, referring originally devices, which serve to prevent the sort of inadvertent mistakes the anyone can make.

The main feature of poka-yoke devices is their exceptional suitability for reducing or eliminating defects through effective feedback and instantaneous correction action. These devices are capable of being used all the time by all worker, it simple and usually with low implementation cost.

2.1.2 History of Poka-Yoke

It was year 1961 when Shigeo Shingo, an industrial engineer at Toyota Motor Corporation introduced the concept of poka yoke. Based on Shingo's long term experience and observation, he developed the concept of poka yoke and turned it from the idea into a formidable tool, a tool for achieving zero defect and eventually eliminating the need of quality control inspections. Since then, poka yoke has been an integral part of Japanese quality and manufacturing system (Shimbun, 1988).

Poka-yoke (pronounced POH-kah Yoh-kay) was history in Japan during the 1960s by Shigeo Shingo who was one of the industrial at Toyota. Recent research by H. Robinson (2012), the term poka-yoke was applied by Shigeo Shingo in the 1960s to industrial processes designed to prevent human errors.

The initial term was "baka-yoke", which means "fool-proofing". This term "baka-yoke" has a dishonorable and offensive connotation. Hence, the term was changed to poka-yoke which means "mistake-proofing".

Shingo distinguished between the concepts of inevitable human mistakes and defects in the production. Defects occur when the mistakes are allowed to reach the customer. The aim of poka-yoke is to design the process so that mistakes can be detected and corrected immediately, eliminating defects at the source. (Anonymous, 2012)

Many definitions for poka yoke can be found from the literature. The following statement describes best the idea of poka yoke from different aspects :

1. "Error proofing is not so much a lean "tool" as it is a way of thinking and evaluating problems. It is based on a philosophy that people do not intentionally make mistakes or perform the work incorrectly, but for various reasons mistakes can do occur" (Meier, 2006)
2. "The original idea behind poka yoke is to respect the intelligence of workers, poka yoke are for freeing worker's time and mind to pursue more creative and value adding activities" (Shimbun, 1988).

2.2 Case study by Dr. Shinge shingeo

a) Problem statement

Dr. Shinge Shingeo has visiting the Yamada Electric Plant in year 1961. He was told for a problem that the factory had with one of its products. The part of the product was a small switch with two push buttons support with two springs. Occasionally, the worker assembling the switch would forget to insert a spring under each push button. Sometimes error would not discovered untill the unit reached to the customer, and the factory would have to dispatch an engineer to be customers site to disassemble the switch. This problem of missing spring was both costly and embrassing. Managment at the factory will warn the employees to pay more attention to their work, but despite everyone's best intentions, the missing spring problem would eventually re-apperar (Chong, 2011)

Before Poka Yoke the process step of assemble the spring is take springs out from parts box that contains many springs and assemble to the switch

After apply Poka Yoke the process step of assemble the spring is take two springs out from parts box that contain many spring, place the two springs at the small dish in front of the part box and finally assemble to the switch.

b) Solution statement

Dr. Shinge Shingeo has get the solution in year 1963 to place the small dish in front of the parts box and the worker's first task is to take two springs out of the box and place them on the dish, then the worker has forgotten to insert the spring (Chong, 2011)

2.3 Type of Poka Yoke

Poka Yoke devices can perform three useful operations in defect prevention. These operations or functions are conducted from three stages where mistakes can occur.

Combining Bayers (1994) and Hinckley (2001) state of mistake and specific related functions of Poka Yokes are as follows:

1. Mistakes is about occur- warning
2. The mistake has caused a defect- shut down
3. Mistake has already occurred but has not yet resulted in a defect- control

Poka Yoke methods have three basic functions to use against mistake such as control, shutdown and warning. Control prevents mistakes, defects, or the flow of defective items to the next process. Shutdown stops normal functions when mistakes or defects are detected or predicted. Warning signal that an abnormality, mistake or defect has been detected. Recognizing that a mistake is about to occur is “prediction”, and recognizing that a mistake or defect has already occurred is “detection” (Hinckley, 2001).

Types of poka-yoke for detecting and preventing errors in a mass production system have a 3 type. Recent research by Dillon, Andrew (1989). Shigeo Shingo recognized three types of poka-yoke for detecting and preventing errors in a mass production system :

- 1) The contact method identifies product defects by testing the product's shape, size, color, or other physical attributes. Contact type is type of poka yoke that are used to avoid the use of incorrect components, pin have fit into holes. For example contact type poka yoke is three pin plug in Figure 2.1



Figure 2.1 : Three pin plug

- 2) The fixed-value is a method alerts the operator if a certain number of movements are not made. For example contact type poka yoke is egg tray in Figure 2.2 . The egg tray function is facilitate production operators put eggs on egg tray and facilitate the operator in the process of classification of eggs and avoid egg is broken



Figure 2.2 : Egg tray

- 3) The motion-step (or sequence) method determines whether the prescribed steps of the process have been followed. Nut runner to tighten a specific number of bolts to a required torque; if the correct torque is not reached or if the operator does not tighten all of the bolts the part will not be released to the next operation

2.3.1 Example of Poka Yoke

The example of poka yoke in daily life is :

The Electric Kettle

- The Electric Kettle On most electric kettles, there is a switch with a sensor that shuts of the electricity to the heating element once it has boiled.This prevents the kettle from boiling until it runs dry.



Figure 2.3 : The electric kettle