

Guidelines to Implementation of Poka yoke in an Assembly Line

V.K. Kannan*, R. Shanmuga Prakash and R. Velavan

Department of Mechanical Engineering, M. Kumarasamy College of Engineering, Karur, India.

*Corresponding author: E-Mail: kalaimanikannan@gmail.com

Abstract

Poka Yoke is a powerful tool used in an all industry such as automobile, electronic, home appliance, locomotive, chemical, oil / refinery, cement industry and others as a mistake proofing helps to prevent the error before it happen. In this paper, we have focused on source of error and guideline for poka yoke implementation in assembly line. Poka yoke is also applicable for all stage of manufacturing like design, production, purchase, vendor development, production engineering, processes planning engineer to come out with defect free products. Poka yoke is not a constant one and also depends on the product, processes, fixture, tool, Gauge and etc. we hope that the journal paper will serve the purpose of poka yoke implementation in an assembly line comes out with zero defect free products.

KEY WORDS: Implementation of poka yoke, Poka yoke, Assembly line Poka yoke.

1. INTRODUCTION

Now Poka yoke is effectively used in the industry across the world because of Shiego Shingo has one developed and introduced in the concept of Poka Yoke in the Year 1961 in Japan for the purpose avoid the human error at work and also produce the part free from defects. Normally mistake in the work is due to error in human. In order to avoid the error, first call them given a warning saying that demand worker to be careful at time of working and also eliminate the change of making a mistake. This is not possible in the industry because no control over them continuously. Error can be control and prevent action on the problem. Error control means that the sense the problem and stop the manufacturing line to take a immediate action Example say Air pressure low is below the lower limit. Build up the air pressure and then operate the line. Prevention action means that the signal will appear as soon as deviation observed, say Low level of lubrication oil. Signal may be light or buzzer sound or visual display. Refill the lubrication oil and operate the machine to avoid the failures.

Each and Every time of error happen, we cannot stop the line for correct and prevent the error. In practical it would not possible in manufacturing line. Poka yoke has to be include in processes itself like electrical poka yoke, mechanical, procedural, visual and human poka yoke helps to delivery defect free product from the manufacturing line in a smart way. In this paper we have focused on the following topics which are possible cause of error at work and guideline to implementation of poka yoke.

Pareto Chart:

Defect Reading:

Table.1. Armature Assembly line Defects Details

Type of Defect	Frequency	%	Defect Code	% Distribution
Stack loose	20	45.45	A	45.45
Ring Punching missing	10	22.72	B	68.17
End insul damage	5	11.36	C	79.53
Com Pre-position wrong	3	6.81	D	86.34
Arm. winding	3	6.81	E	93.15
Hot stacking	2	4.54	F	97.69
Arm. Testing	1	2.27	G	99.96

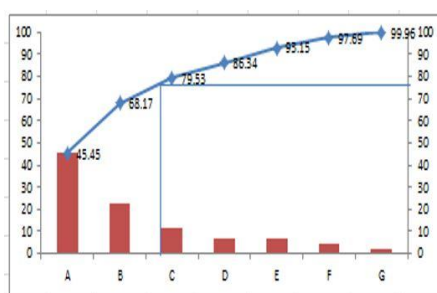





Figure.1. Defect type Vs Quantity Vs Contribution %

Pareto chart was made for rejection, based on the pareto chart rules, 80 % problem- stack loose is taken for poka yoke implementation observed in shaft and core insertion assembly stage. After complete investigation, shaft and core size to be checked before assembly.

Stage 2: Introduce defect warning to operator (Warning Level): Immediate action to prevent the defects: Quality alert (Warning) introduced in shaft and core assembly. Operator asked to check the shaft od with ring gauge before proceed the shaft and core assembly.

Table.2. Quality Alert for Failures

Part	Assembly	Problem	Quality Alert
Shaft 		Shaft loose observed	Cause: Shaft OD under size Warning: before Assembly, Check the shaft OD with ring gauge.
core 			

Stage 3: Check the defects level: Still there will be 3-5 nos rejection observed per shift in the assembly section due to forgotten of the warning instruction by employee or operator at time of operation.

Stage 4: Introduce defect prevention in operation or process (Prevention Level): In order to prevent the defects, we have introduce ring gauge interface with machine operation ON/OFF. Ring gauge have Go / No Go Gauge, Shaft has to pass through these GO/ No Go gauge then only machine will start functioning otherwise it would not start. Which helps to prevent the defect.

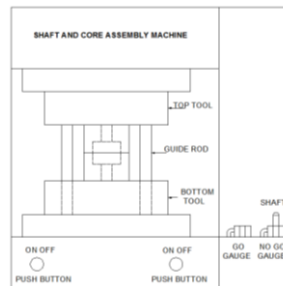


Figure.2. Ring gauge interface with Shaft and Core Assembly machine

Stage 5: Check the defects level: Still there will be 1-2 nos rejection observed per shift in the assembly section due to intentional by passing the shaft OD inspection (using one accepted shaft using continuously to operate the machine).

Stage 6: Introduce defect elimination in operation or process (Elimination Level): In order to eliminate the defects, we have introduce load cell & indicator along with ring gauge interface with machine operation ON/OFF. Ring gauge have Go / No Go Gauge, Shaft has to pass through these GO/ No Go gauge then only machine will start functioning otherwise it would not start . Main purpose of using load cell and indicator to capture the shaft OD defects even it by pass the Ring gauge (GO/ NO GO) Checking. In load indicator, Load will be set for specified tolerance of shaft OD. If shaft OD is less than the specification and it will be captured by load indicator.

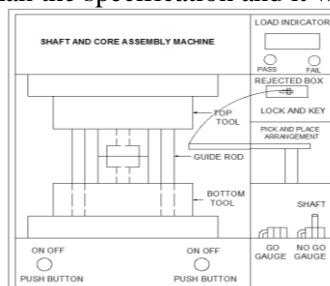


Figure.3. Shaft and Core Assembly machine interface with load cell and indicator

Shaft OD Over size: Pressing load will be more than specification straightway pressed assembly will be rejected and put in to rejected box with lock and key to avoid rejected part mixed with good parts

Shaft OD under size: Pressing load will be lower than specification straightway pressed assembly will be rejected and put in to rejected box with lock and key to avoid rejected part mixed with good parts

Stage 7: Achieve zero defect in operation or process: No rejection observed due to shaft OD size variation in the assembly section results Zero defect observed

4. CONCLUSION

Now a days all customer wants the defect free quality from their supplier and also from sub supplier. Because of the reasons, we have detail discuss about the source of the error or defects and how to implement poka yoke in a assembly line. Currently Some of the poka yoke methods guide pin for tool and die assembly, error detection for machine running, stop and maintenance indication, warning and counter alarm for tool life monitoring , limit switch for performing operation with in limit of specification are being used in industry to adopt their needs .Most of the manufacturer believes that the error or defect will be minimized or eliminated once the processes parameter controlled effectively and results good products are coming out from the machine. Some of the latest poka yoke methods are like vision system, laser assisted machining process, electronic interfacing, warning and voice information to defects or failures, voice recognition, thumb based activation, eye detection for person identification. Photo guard to prevent human interference with machine , online Cp and Cpk monitoring , procedural method, limit sample for visual inspection, letter and colour for identify the place and warning, picture for do and do not, certified person for servicing are effectively incorporate in special machine to suits their needs. Pok yoke can implemented in various departments like design a poka yoke in the area of part design, machine design, tool design, fixture design, process parameter and system design. The detail information about the various stage of implementation of poka yoke in an assembly line will serve the purpose. Poka yoke is not a fixed one and it will be varied depends on the products or processes and other systems. It has to adopt to suit what you want to have control over like zero defects in part assembly or processes and system.

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