



IJEAST

INTERNATIONAL JOURNAL
OF ENGINEERING APPLIED SCIENCE
AND TECHNOLOGY



VOLUME : 3 ISSUE : 06 Print / Issue Publication Date: 14-Mar-2019



ISSN : 2455-2143



Indexed In



WWW.IJEAST.COM

editor@ijeast.com

STUDY ON “PRODUCTIVITY IMPROVEMENT BY USING POKA YOKE”

Pankaj Soni
Department of Mechanical Engineering
BTIRT, Sagar, Madhya Pradesh, India

Tarun Kumar Yadav
Department of Mechanical Engineering
BTIRT, Sagar, Madhya Pradesh, India

Abstract— In this study the poka-yoke technique is dealing with the productivity of the company and with the perfection of the product which a company is making. After using the poka-yoke technique we can say that with the use of ‘poka-yoke’ we can be a perfect competitor in market for small industries. This study showing the implementation of poka-yoke technique in liner forming department which is making liner of lldpe.

Keywords— Poka yoke, Productivity, Mistake, Defect, Liner, Mouth.

I. INTRODUCTION

Each and every company working for better market value and for more profit. We can use a simple term that is productivity. Everyone is working for high productivity. The productivity means get to know how much output we are getting in a unified input. That is called productivity. There are 2 ways to get high productivity: 1st to get more output in same input and the 2nd to get same output in less input. These are two ways to increase productivity of any industry. So for high productivity we need to remember some points like workers avoiding the cause of rework and making the system mistake proof which gives us zero defect product. Zero defect products is the aim of every company but at some point everyone is doing mistakes unintentionally because of that we are facing some kind of rework and defective product. There are many reasons for that like man type, machine type and material type. So we need to find that cause of mistake. To avoid the mistake and to make our system mistake free there is a more effective technique which name is poka-yoke. Poka-yoke is a quality assurance technique developed by Japanese manufacturing engineer Shigeo Shingo. The aim of poka-yoke is to eliminate defects in a product by preventing or correcting mistakes as early as possible. Poka-yoke has been used most frequently in manufacturing environments.

It's very simple technique to identify problems and resolve them. The best part of it it's easy to understand.

Example: - Cloth iron heat regulator.

Before some year the cloths get burnet by the iron due to overheating. Because it's not possible to remove/plugged in the switch at all the time to regulate the heat of iron. But nowadays you can see a heat regulator on the iron panel it's

for regulate the heat according to the requirement. This is the best example of poka yoke technique. This problem avoiding mechanism is called poka yoke. In figure .01 you can see the old iron where the regulator is not available they are burning the cloths and in figure .02 you can see the regulator fitted in the iron to avoid the mistakes and make it user friendly and comfort.



Figure .01 Without poka yoke



Figure .02 With poka yoke

History of Poka-yoke.

Poka-yoke (pronounced "POH-kah YOH-kay") [1] was invented by Shigeo Shingo in the 1960s. The term "poka-yoke" comes from the Japanese words "poka" (inadvertent mistake) and "yoke" (prevent). [2] The essential idea of poka-



yoke is to design your process so that mistakes are impossible or at least easily detected and corrected.

Shigeo Shingo was a leading proponent of statistical process control in Japanese manufacturing in the 1950s, but became frustrated with the statistical approach as he realized that it would never reduce product defects to zero. Statistical sampling implies that some products go untested, with the result that some rate of defects would always reach the customer. While visiting the Yamada Electric plant in 1961, Shingo was told of a problem that the factory had with one of its products. Part of the product was a small switch with two push-buttons supported by two springs. Occasionally, the worker assembling the switch would forget to insert a spring under each push-button. Sometimes the error would not be discovered until the unit reached a customer, and the factory would have to dispatch an engineer to the customer site to disassemble the switch, insert the missing spring, and re-assemble the switch. This problem of the missing spring was both costly and embarrassing. Management at the factory would warn the employees to pay more attention to their work, but despite everyone's best intentions, the missing spring problem would eventually re-appear. Shingo suggested a solution that became the first poka-yoke device. [3] In the old method, a worker began by taking two springs out of a large parts box and then assembled a switch. In the new approach, a small dish is placed 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 assembles the switch. If any spring remains on the dish, then the worker knows that he or she has forgotten to insert it. The new procedure completely eliminated the problem of the missing springs. Shingo went on to develop this mistake-proofing concept for the next three decades. One crucial distinction he made was between a mistake and a defect. Mistakes are inevitable; people are human and cannot be expected to concentrate all the time on the work in front of them or to understand completely the instructions they are given. Defects result from allowing a mistake to reach the customer, and defects are entirely avoidable. The goal of poka-yoke is to engineer the process so that mistakes can be prevented or immediately detected and corrected. Poka-yoke devices proliferated in Japanese plants over the next three decades, causing one observer to note. [4]

It is not one device, but the application of hundreds and thousands of these very simple "fail-safing" mechanisms that day after day has brought the quality miracle to Japan. Each one is relatively simple something you easily could do on your own. It is the totality, the hundreds of devices, that is almost frightening to behold.

About the company: The Company is situated in the Pithampur, Indore (M.P.). The product which the company is making they are big bags, liner for big bags and tarpaulin etc. We are starting from beginning means from row material entering.

Overall process of the company.

Row material
Roll production
Carry roll
Roll hanging
Roll opening and settle
Setup size
Liner cutting and sealing
Counting
Bundle making
Bag packing
Weighting
Dispatch
FIBC bag making

1 Row material: - This is seeds of LLDPE which we get from oplane company. This seeds is used as the row material. This seed is recycle.

2- Roll production: - This seed is used in extrusion machine to get roll. We are using kabra extrusion machine for that. Basically this machine melts the seeds then we flows the air in the melted polyethene. The height f machine is approx 20 meter. The use of this height is to make film cold and then core is fitted in the machine assembly to make a roll.

3- Carry roll: - In this part we need to do a heavy work we need to carry the roll from ground floor production department to second floor that is line department.

4- Roll hanging: - After getting the roll on floor we hang it on a stand to open it. This stand is made up of iron. We hang it with the use of forklift because of the weight of the roll.

5- Roll opening and settle: - In this process currently we are using 3 workers. Two of them start to rotate it to open it and the other one starts to settle down it down. The settlement of the film is important thing because if it's not settled well then it will create issue while cutting.

6- Setup size: - The companies are working to fulfill the costumers requirement. As every costumers have his own shape and size according to requirement. In this process we need to fix the setup as the required length. Why we are not talking



about the width of liner because this thing we already got by roll making department.

7- Liner cutting and sealing: - In this process we cut the opened film from the roll. If the customer wants bottom sealing then we do sealing on the bottom side. If they want formfit liner then also we need to do side sealing on it and make it like bottle neck. If it's open liner then only cutting is necessary.

8- Counting: - When we cut a roll so after that we need to count the piece. Every time the roll weight is not same and the liner size is also not same so predictions are not acceptable.

9- Bundle making: - In this process we make the bundle of counted liner. We need to make bundle of 10 liners who can easy to carry.

10- Bag packing: - In this process we put the bundle in plastic bags. The main thing which we need to keep in our mind that it the weight of the bag. It should be balanced means two worker can carry the bag. It should be below then 70 kg always.

11- Weighting: - The weight of every bag is must. We need to take bag and write it on the bag as well as in our record. So two persons are carrying the bag on the scale and then we note the weight of every bag.

12- Dispatching: - After completing the weight work and counting work. We need to send it to the dispatching department and should share that the costumers name and how much quantity we are giving to them.

13- FIBC bag making: - The liner which we made that is used in FIBC bags. FIBC bag is simply a bag in which we put the liner to make it leak proof and should oppose to change the inner materials contamination.

II. LITERATURE REVIEW

Pratik D. Tak Says in his study paper in 2015, A company is making a component on which they are doing punching of metal clips. So they need to forward the plate at next station where the punching will takes place in that condition when all the metal clips on the plate so that they can start the punching. But due to some reasons sometimes some metal clips are missing on some plates so it will waste the time in recollecting the metal clips for proper punching. This problem is resolve with the help of poka yoke they use a proximity sensor and some other components. The proximity sensor is used which will work like human eyes and the work of that sensor is to sense the clips availability on the plates. If there are less required metal clips so machine will not allow the plate for next process. With the help of poka yoke some kind of output is achieved like hike in productivity, Zero ppm, rework is also eliminated and mistakes are totally avoided. [5]

A study was conducted at an automotive component assembly factory specializing in the assembly of harnesses for Japanese car models and some local models. This study focused on the sub-assembly line. The main types of faults detected were incorrect position, missing component and half inserted. Some possible causes of these three problems are workers who can

not continue or do not follow the standard operating procedure (SOP), involuntary error, negligence and no detection device. They then solve these problems with the use of poka yke and create a Peripheral Interface Controller (PIC) programming device to help you. The system operates when the power is on, the cover of the first part (for example, connector A) opens and allows the operator to take the part. If the part is inserted correctly, the touch sensor detects it and the first cover closes, while the second cover, which has another part B, opens. A buzzer sounds if an item is missing or if an incorrect insert or half of the insertion is inserted. The sound of the buzzer will be for a period of time before it stops. The second cover does not open until the error is corrected. The circuit is a closed loop system and will be repeated until the last element is inserted. So this problem is solved with the use of the sensor device.

III. PROBLEM

The main aim of every company is to achieve customer satisfaction. We will get this thing only when we provide perfect product to the customer and one more thing the product completing is on time. This thing is from customer side but from company side if we want continues improvement and growth of the company so we need to reduce the waste and increase the productivity. I found the issue in the liner forming department which is making liners to put it in big bags of flexible intermediate bulk container (FIBC). So what is liner, the liner is packet of low liner density polyethylene (lldpe). It can be hollow from one side or can be shield from one side. The purpose of making liner is to making the bag leak proof and other contamination can't effect the inner product's contamination. We are getting roll from the roll production department and we need to open it and cut it on required length so that we can fulfill the requirement of the customer. Before sometime the film cutting process was happening with the use of scissor at the desirable length. The problem was that while cutting the film they don't have any special device to cut the perfect mouth of the liner. Mouth is the area from where consumer will enter the material in the liner. So the mouth is not perfectly straight. So that's the reason of rework and product waste. So if we eliminate the cause of it so we can improve the productivity while reducing the rework and material wasting.



Figure .03 Liner mouth defect

IV. RESEARCH METHODOLOGY

After analyzing the root cause of defects we got the point and can say that the reason can be workers skill or machine issue. So we try to implement a poka yoke technique in machine. For perfect liner mouth we are using 2 iron angle of L shape. The benefit of that angle is that, they can be move at required length. The angle is fitted on the table on which we are cutting the film, with the use of nut-volts. So when we need to change the length of liner we simply open the volts and change the position of the angle and can cut the film again. The cost of it is also low. With the use of it the workers enjoying the work now and doing the same thing in less time. As we are facing the other issue that is material wasting due to misalign mouth now the scissor is going straight, they angle force it to go in straight so the productivity is effected and we are producing more product then before.



Figure .05 After installing the iron angle liner mouth

V. CONCLUSION:

On the basis of our study we can say that, the poka yoke technique is best to improve the productivity as well as to decrease the wastage. The implementation of the technique is not too costly and the effect of it on productivity is really attractive. By past record we see that, the wastage percentage is 11% for 1 roll and taking 15 second to cut a single liner. After installing the poka yoke technique the wastage percentage which we achieved that is 4% and the cutting time is 6 second for a single liner. If we think that before the company is producing 100% product, so after implementing this technique the production is increased 150%. So with the help of poka yoke we can with stand in market and become a perfect competitor for other company.

VI. ACKNOWLEDGEMENT

This project consumed huge ammount of work, research and dedication. Still, impletation would not have been possible if we did not have a support of many indivisuals and organozations. Therefore we would like to extend our sincere gratitude to all of them.

VII. REFERENCE

- [1] John R. Grout & Brian T. Downs (Feb 2018) "Mistake-Proofing and Measurement Control Charts " Quality Management Journal Volume 5, 1998 - Issue 2 Pages 67-75
- [2] Shigeo Shingo (April 1986) "Zero Quality Control: Source Inspection and the Poka-yoke System" 1st Edition Page 45 ISBN 9780915299072 - CAT# PP9907



Figure.04. Iron angle



- [3] Shigeo Shingo (July 1987) "The Sayings of Shigeo Shingo: Key Strategies for Plant Improvement" 1st Edition Page 145 ISBN 9780915299157 - CAT# PP9915
- [4] NIKKAN KOGYO SHIMBUN (FEBRUARY 1989) "POKA-YOKE: IMPROVING PRODUCT QUALITY BY PREVENTING DEFECTS" 1ST EDITION PAGE 7 ISBN 9780915299317 - CAT# PP9931
- [5] Pratik D. Tak, Shravan S. Wagh (Feb-2015) " POKA YOKE IMPLIMENTATION ON PUNCHING MACHINE: A CASE STUDY" International Journal of Research in Engineering and Technology eISSN: 2319-1163 | pISSN: 2321-7308
- [6] Lee Ing Yi, Sha'ri Mohd Yusof (June 2007) "PRODUCT QUALITY IMPROVEMENT THROUGH POKA YOKE TECHNIQUE" Jurnal Mekanikal, No. 23, 74 – 82
- [7] Ishani kar, Dr. Shobha R, Anuj Rajan (June-2015) "AN EFFECTIVE USE OF POKA YOKE FOR A NEW PROCESS IN ASSEMBLY LINE" International Research Journal of Engineering and Technology (IRJET) Volume: 02 Issue: 03
- [8] Patel Parikshit K, Vidya Nair, Patel Nikunj S (February 2013) "A Review on use of Mistake Proofing (Poka Yoke) Tool in Blow Molding Process" International Journal of Science and Research (IJSR) Volume 2 Issue 2
- [9] Mr. Parikshit S. Patil, Mr. Sangappa P. Parit, Mr. Y.N. Burali (February 2013) "Review Paper On Poka Yoke: The Revolutionary Idea In Total Productive Management" Research Inventy: International Journal Of Engineering And Science Issn: 2278-4721, Vol. 2, Issue 4 Pp 19-24
- [10] Niranjana, Yogesh Sharma (Feb 2015) "Implementation of poka-yoke in Indian manufacturing industry by: enablers, barriers and questionnaire based survey" INTERNATIONAL JOURNAL OF R&D IN ENGINEERING, SCIENCE AND MANAGEMENT vol.1, issue VII, p.p.147-155
- [11] Aishwarya J. Kurhade (November, 2015) "REVIEW ON POKA-YOKE: TECHNIQUE TO PREVENT DEFECTS" INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY ISSN: 2277-9655 Page 652-659
- [12] Mr. Sujay Biswas, Dr. Abhijit Chakraborty (2016) "Using Poka -Yoke for the Development of SMEs" Volume-5, Issue-9, pp-15-18

IJEAST

INTERNATIONAL JOURNAL
OF ENGINEERING APPLIED SCIENCE
AND TECHNOLOGY

ABOUT IJEAST

International Journal of Engineering Applied Science and Technology (IJEAST) is a peer-reviewed, open access journal that publishes high-quality research papers in the field of Engineering, Applied Science and Technology.

IJEAST aims to provide a platform for researchers, academicians, and professionals to share their innovative ideas, research findings, and practical experiences with the global scientific community.

FOCUS AREAS

- Engineering
- Applied Science
- Technology
- Innovation & Development
- Interdisciplinary Studies



PEER REVIEWED

All submissions are rigorously peer reviewed to ensure quality.



OPEN ACCESS

Free and unrestricted access to research for all.



GLOBAL REACH

Connecting researchers and professionals worldwide.



TIMELY PUBLICATION

We ensure a swift and efficient publication process.



For more information, visit our website
www.ijeast.com



INTERNATIONAL JOURNAL
OF ENGINEERING APPLIED SCIENCE
AND TECHNOLOGY

✉ editor@ijeast.com

🌐 www.ijeast.com

📍 India



2455-2143