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KAIZEN: A Lean Manufacturing Technique

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Abstract : *Now-a-days the ultimate goal of all industries is to enhance productivity through simplified system and incremental improvements by applying some modern available techniques. At present, many manufacturing companies are facing problems such as high quality rejection, high inventories, high lead time, high costs of production, and inability to cope with customer orders. By implementing and practicing the lean production system many problems can be solved without employing high-tech and high-touch approaches but by involving people on the shop floor in Kaizen activities. For continuous improvement in an organization, Japanese philosophy Kaizen is very popular. Flawless concepts of Kaizen methodology and proper implementation of tools can lead to a successful kaizen program in a company. Kaizen is one of the powerful tools of lean manufacturing. Kaizen refers to continuous improvement in performance, cost and quality. Kaizen ensures that manufacturing processes become leaner and fitter, but eliminate waste (problem) where value is added. The main objective of this paper is to provide a background on kaizen, present an overview of kaizen concepts that are used to transform a company into a high performing lean enterprise.*

Keywords- *Kaizen, 5S, Pokayoke, Muda, Jidoka*

I. INTRODUCTION

Kaizen was created in Japan following World War II. The origin of Kaizen can be traced back to the Quality Guru Dr. W. Edwards Deming, but it was Masaki Imai who popularized the concept of Kaizen to become a revolution around the world. Kaizen is a combination of two Japanese words (kai+zen), literally means ―Change for the Better. It is a compound word involving two concepts: Kai (change) and Zen (for the better). This is translated as "Continuous Improvement" in English. Kaizen means improvement. Moreover it means continuing improvement in domestic life and working life. Kaizen means continuing improvement involving everyone - from top management to managers and workers, when it is practiced at workplace. The Kaizen philosophy has been implemented in organizations around the world as a way to improve production values while also improving employee morale and safety. The Kaizen philosophy may be applied to any workplace scenario due to its simple nature. Taiichi Ohno and Shigeo Shingo developed in at Toyota. The kaizen in important tool for Lean Manufacturing, the Toyata Production System (TPS), Just In Time other effective manufacturing strategies.

II. METHODOLOGY

There is a standard methodology of Kaizen which can be used in different fields like engineering, manufacturing, management and other supporting processes in the organization. The methodology of Kaizen is also known as Deming's PDCA Cycle or Shewhart Cycle.

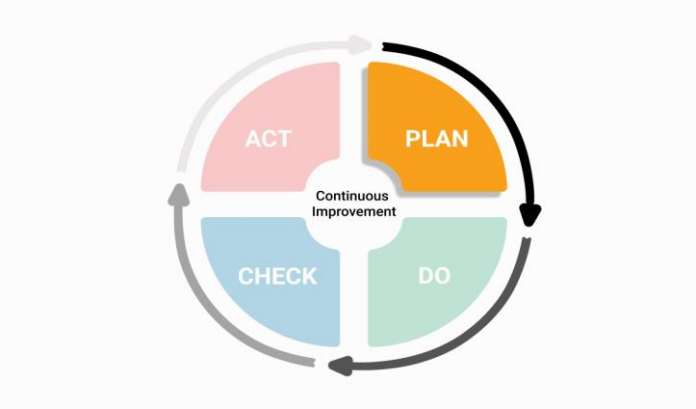

Fig. 1 PDCA cycle

Kaizen will help in teaching people how they can perform tasks in a rapid way through experiments and this will lead to identify & reduce/eliminate wastes in the process and the selected process can be improved. Research defines that there are no standard technique/instruments are used for implementation of Kaizen. The Kaizen Toolbox contains various tools related with Kaizen are as following:

3.1 5S:

It is a methodology for organizing, cleaning, developing, and sustaining a productive work environment. It‘s one of the simplest Lean tools to implement, provides immediate return on investment, crosses all industry boundaries, and is applicable to every function with an organization. The 5S’s stands for 5 Japanese words that constitute good housekeeping. roughly translated they are; Sort (Seiri), Set in order (Seiton), Shine (Seiso), Standardize (Seiketsu), Sustain (Shitsuke).

Fig. 2 5S

Seiri- Sort through and Sort Out, red tag all unneeded items and moves them out to an established area for disposition within a predetermined time.
Seiton- Identify the best location for remaining items and label them. A place for everything & everything in its place.
Seiso- Clean everything, inside and out. Use visual sweeps to ensure everything is where it should be and that junk is not accumulating.
Seiketsu- Create the rules for maintaining and controlling the first 3 S‘s.
Shitsuke- Ensure adherence to the 5S standards through communication, training, self-discipline and rewards.

3.2 5 Why's technique:

This technique enables a profound discussion about the causes of a problem, which is a very crucial step towards identifying solutions, based on what diverse persons bring forward. The primary goal of the technique is to determine the root cause of a defect or problem. The 5 Whys strategy involves looking at any problem and asking: "Why?" and "What caused this problem?" By asking the question "Why" you can separate the symptoms from the causes of a problem.

3.3 Elimination of seven wastes (Muda):

The simplest way to describe waste is as "Something that adds no Value." Customers would not be happy to pay for any action that does not add value to what they want and nor should we be. The seven waste are:

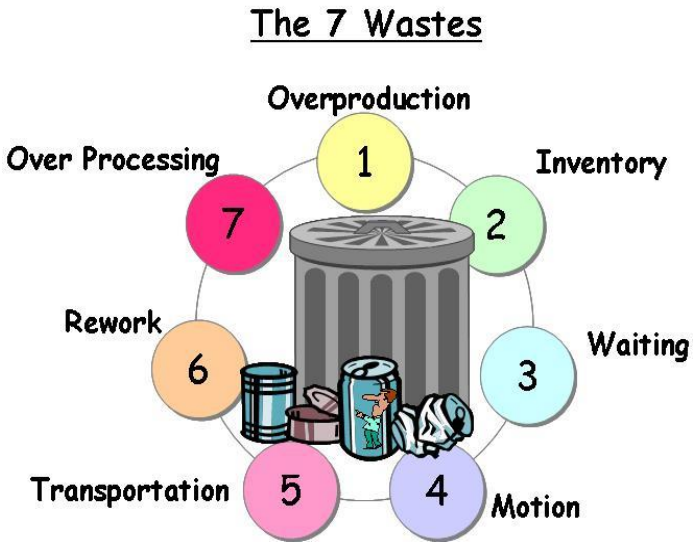

Fig.3 Muda

3.3.1 Waste due to Overproduction:

This is usually because of working with oversize batches, long lead times, poor supplier relations and a host of other reasons. Overproduction leads to high levels of inventory which mask many of the problems within your organization.

3.3.2 Waste due to Inventory:

Excess raw material, work-in-process, or finished goods causing longer lead times, obsolescence, damaged goods, transportation and storage costs, and delay. Also, extra inventory hides problems such as production imbalance, late deliveries from suppliers, defects, equipment downtime, and long setup times.

3.3.3 Waste due to Waiting:

Workers merely serving to watch an automated machine or having to stand around waiting for the next processing step, tool, supply, part, etc., or just plain having no work because of stock outs, lot processing delays, equipment downtime, and capacity bottlenecks.

3.3.4 Waste due to Motion:

Excessive travel between work stations, excessive machine movements from start point to work start point are all examples of the waste of Motion. All of these wasteful motions cost you time (money) and cause stress on your employees and machines.

3.3.5 Waste due to Transportation:

Carrying work in process long distances, creating inefficient transport, or moving materials, parts, or finished goods into or out of storage or between processes.

3.3.6 Waste due to Defects:

Production of defective parts or correction. Repair or rework, scrap, replacement production, and inspection mean wasteful handling, time, and effort.

3.3.7 Waste due to Over Processing:

The waste of Over processing is where we use inappropriate techniques, oversize equipment, working to tolerances that are too tight, perform processes that are not required by the customer and so forth. All of these

things cost us time and money. Taking unneeded steps to process the parts. Inefficiently processing due to poor tool and product design, causing unnecessary motion and producing defects.

3.4 7 QC Tool's:

3.4.1 Cause and Effect Diagram:

Identifies many possible causes for an effect or problem and sorts ideas into useful categories.

3.4.2 Check sheet:

A structured, prepared form for collecting and analyzing data; a generic tool that can be adapted for a wide variety of purposes.

3.4.3 Control chart:

Graph used to study how a process changes over time. Comparing current data to historical control limits leads to conclusions about whether the process variation is consistent or is unpredictable.

3.4.4 Histogram:

The most commonly used graph for showing frequency distributions, or how often each different value in a set of data occurs.

3.4.5 Pareto chart:

A bar graph that shows which factors are more significant.

3.4.6 Scatter diagram:

A graphical technique to analyse the relationship between two variables.

3.4.7 Flow chart:

It is a graphical tool that shows the major steps in a process. Flow charts are a useful tool for examining how various steps are related to each other.

3.5 Jidoka:

By definition, Jidoka is a Lean method that is widely adopted in manufacturing and product development. Also known as autonomation, it is a simple way of protecting your company from delivering products of low quality or defects to your customers while trying to keep up your takt time. It may be described as intelligent automation or automation with a human touch. By implementing the Jidoka concept, anyone in your organization can stop the workflow as soon as they notice a problem that harms your product's quality. The purpose of automation is that it makes possible the rapid or immediate address, identification and correction of mistakes that occur in process.

3.6 PDCA Cycle:

PDCA is an iterative four step management method used in business for the control and continuous improvement of processes and products. It is also known as the Deming Cycle /Deming Circle / Deming Wheel / Shewhart Cycle.

Plan: The objective is to plan for changes predict the results.
Do: The plan is executed by taking small steps in controlled circumstances.
Check: The results are studied.
Act: The organization takes action to improve the process.

3.7 Pokayoke:

Poka-Yoke is a Japanese term that means Mistake Proofing. A poka-yoke is any mechanism in a process that helps an equipment operator avoid mistakes. Its purpose is to eliminate product defects by preventing, correcting, or drawing attention to human errors as they occur. Its purpose is to eliminate product defects by preventing, correcting or drawing attention to human error as they occur.

III. IMPLEMENTATION

The below figure shows a Kaizen sheet which can be used to keep a track on the continuous improvement taking place in the Industry for different departments. By putting down the before and after images we can justify as to how continuous improvement has taken place and by stating the problem and we can describe as to why improvement is needed and the after improvement effects can also be stated which can be maintained as a document for Kaizen.

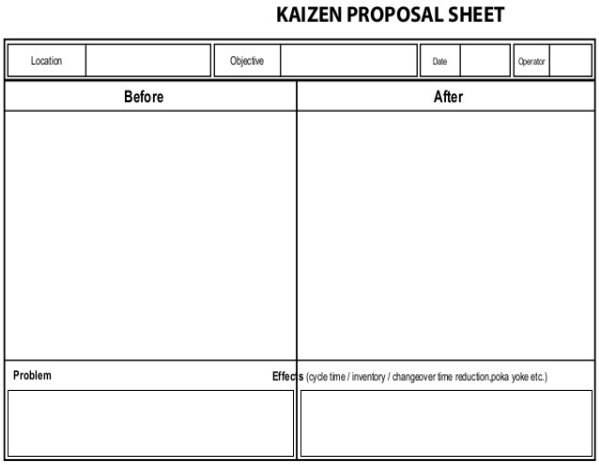

Fig. 4 Kaizen sheet

IV CONCLUSION

Tools and techniques for eliminating wastes, helps manufacturers to improve the productivity of their enterprises. Kaizen being one of the best Lean manufacturing technique gives a broad view of past practices and researches carried out across the globe. Kaizen is widely accepted philosophy in manufacturing industries and has a great scope of research. Hence by implementing Kaizen there has been a lot of improvement in the process flow due to better usage of workplace, stock confinement, prevention from losing tool, increased efficiency, process development by cost reduction, travel time of materials has been reduced, improvement in safety, improvised working conditions for workers, increase of awareness and morale, etc.

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