RESEARCH ARTICLE OPEN ACCESS

KAIZEN – A case study

Manjunath Shettar*, Pavan Hiremath**, Nikhil R***, Vithal Rao Chauhan****
*Asst. Professor, Department of Mechanical & Manufacturing Engineering, Manipal Institute of Technology, Manipal University, Manipal, Karnataka, India.,
**Asst. Professor, Department of Mechanical & Manufacturing Engineering, Manipal Institute of Technology, Manipal University, Manipal, Karnataka, India.
***Asst. Professor, Department of Industrial and Production Engineering, Gogte Institute of Technology, Belagavi India.
****Asst. Professor, Department of Mechanical Engineering, Rao Bahadur Y Mahabale shwarappa Engineering College, Bellary, India.

ABSTRACT
The ultimate objective of manufacturing industries is to increase productivity with high quality. 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. 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. A case study of implementation of Kaizen's has been discussed.
Keywords: Kaizen, Lean Manufacturing, Muda, Lead time,..

I. INTRODUCTION

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 (Imai, 1986).

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. (Koichi)

Kaizen - The Definition

Kaizen (Ky ' zen) is a Japanese term that means continuous improvement, taken from words 'Kai', which means continuous and 'zen' which means improvement. Some translate 'Kai' to mean change and 'zen' to mean good, or for the better *(Palmer, 2001).*

II. LITERATURE REVIEW

In the literature that mentions kaizen is often emphasized small group activity such as quality circles and/or suggestions made by individual workers. In TPS (Ohno, 1978), which explains kaizen methods are useful to increase the productivity and product quality.

Suzaki (1987) explains that Kaizen is a philosophy widely practiced in belief that, that there is no end to make a process better. Each small improvement consists of many levels of development. Mainly used for improving manufacturing processes.

Teian (1992) describes that, Kaizen is much more than just a means of improvement, since it speak to the day by day obstacles happening in the work environment and the way in which these obstacles are succeed. Kaizen can be applied to where on need of improvement.

Deniels (1995) describes that the best approach to accomplish principal change on the shop floor is to empower operators to create their own particular measures, to adjust business procedures and to utilize them to drive their Kaizen exercises.

The author clarifies that operators are the specialists and once they understand that they are the one, who is going tackle the obstacles, and afterward everything they need is some direction.

Womack and Jones (1996) refer to Kaizen as a lean thinking and lay out a systematic approach to help organizations systematically to reduce waste. They describe waste as any human activity that absorbs resources but creates or adds no value to the process. Most employees could identify muda in their workplace, but unfortunately the waste that they identify is only the tip of the iceberg. The authors state that until these employees have been taught the essentials of lean thinking, they are unable to perceive the waste actually present in their environment.

III. KAIZEN EVENT

This is the means by which we get employees involved in Kaizen. The accompanying pointers offer direction for anybody contemplating actualizing Kaizen:

1. Choose a segment of the business, whereupon Kaizen will be actualized.
2. Settle on a group pioneer for the group - guarantee this individual has all the right preparing.
3. Unite the group, and clarify the hypothesis behind Kaizen, let the group talk about issues in the work environment.
4. Get the group to talk about the same number of issues as they would wish to handle, recall that it doesn't need to be a solitary issue against which they ought to center, a few little issues are constantly advantageous taking a gander at.
5. Let the group choose which issue(s) will be handled. It is the group that knows best about its surroundings.
6. Let the group choose what the fundamental driver of concern with respect to the issue(s) are.
7. Let the group choose how the issue(s) will be measured - how has the current issue been chosen? Also, by what means will we screen the current circumstance?
8. Data about the issue is accumulated.
9. The group ought to now be in a position to concoct a target circumstance, let the group take a gander at the benefits of diverse arrangements, let the group settle on target culmination, execution dates.
10. Let the group, choose how to achieve the change to the work environment, is it going to be outwardly conveyed? Verbally conveyed? (Work-practice changes), and so on.
11. At last let the group choose how they will screen the progressions they bring, to perceive how fruitful they have been.

IV. Case Study

A case study was conducted in an automotive parts manufacturing industry. Kaizen's are implemented in hydraulic actuator assembly line.

Kaizen – 1

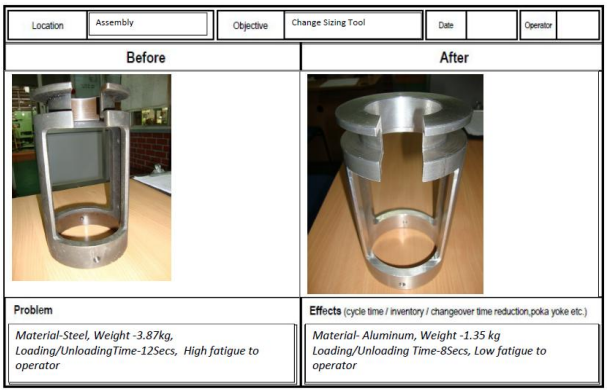

Figure 1: Kaizen 1

Sizing tool is used for the proper alignment of piston rod sub-assembly in to the tube. Operator has to pick up sizing tool and place properly on the tube in the assembly stage for each assembly of actuator. Due to the more weight of sizing tool, the fatigue to operator is more. Also the loading/unloading time is more. By the high fatigue to operator, he misses the usage of sizing tool during assembly, which will lead to the misalignment of piston rod assembly and the tube. Due to this misalignment the actuator doesn't operate to the requirement, while testing in cyclic test rig. This ends up with the rejection of actuator, which will be again reworked. To overcome all above problems, reduction of weight of sizing tool is must. So as above shown in figure, the sizing tool material is changed from steel to aluminium, which leads to reduction in weight by 2.52 kg and reduction in loading/unloading time by 4 secs.

Kaizen – 2

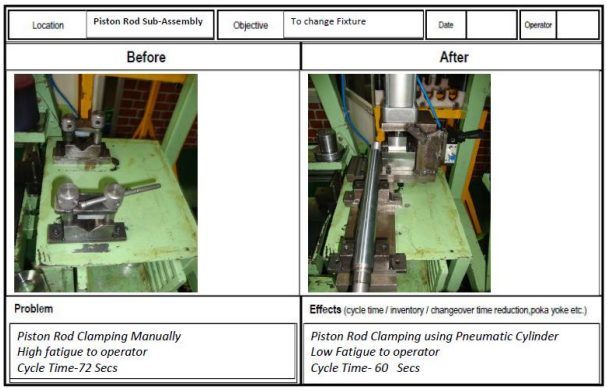

Figure 2: Kaizen 2

Piston rod is clamped by the clamping leaf and clamping bolts. Clamping would have been done manually, as operator had to tight all four clamping bolts by the rod as shown in figure 2. All four clamping bolts have to be tightened to hold piston rod rigidly in fixture. For tightening it took more time as well, it's required extra effort to operator.

Improved fixture, Piston rod is clamped by the pneumatic actuator arrangement as shown in above figures. As piston rod has rectangular slot on its one end, the clamping has done on that rectangular slot to hold piston rod rigidly. Due to pneumatic clamping, time and effort by operator is reduced.

Kaizen – 3

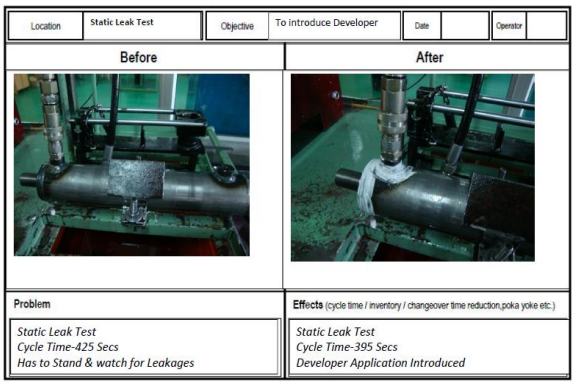

Figure 3: Kaizen 3

Previously operator has to stand and inspect closely, the cylinder for any leakages. It was taking more time for the operator to inspect the cylinder for leakages at the ends and welded part.

By introducing developer (Magnaflux) for leak inspection as shown in figure, the time has reduced by 30 secs.

Kaizen – 4

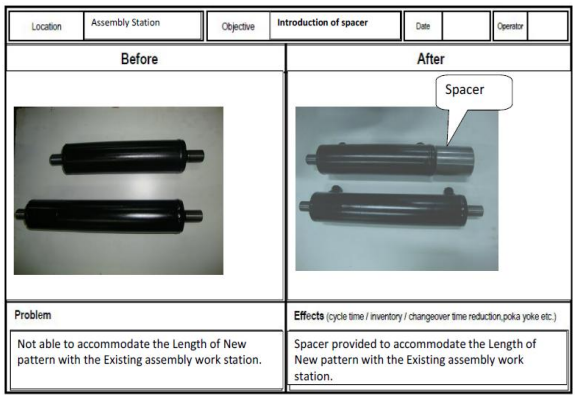

Figure 4: Kaizen 4

Two different sized actuators are assembled on same assembly area. One is having 410 mm length and another one 350 mm. As shown in above figure spacer is introduced for small lengthened actuator.
Spacer -To accommodate the length of new pattern with the existing assembly work station.
Benefits achieved by kaizen:

- Reduction in cycle time.
- Lower Operator fatigue.
- Lower in quality rejection.
- New pattern accommodated.
- Increase in Operator confidence and morale.

V. CONCLUSION

- Kaizen implies change. It implies little changes done reliably over a drawn out stretch of time. On the off chance that you incorporate the kaizen standards into your working environment, you will see perceptible upgrades immediately, and extraordinary enhancements in the long haul.
- The advantages to applying the standards of kaizen are complex. Arrangements accentuate practical, ease approaches, constant modification and change gets to be conceivable and further attractive. It is not even constantly important to increase upper administration support to roll out improvements.
- The Kaizen methodology endeavors to give unified consideration regarding both process and result.
- Kaizen gives the ideal information for future execution of any thou

REFERENCES

[1] Imai M (1986), Kaizen: The Key to Japan's Competitive Success, *McGraw Hill*, New York, USA.
[2] Koichi Shimizu, Transforming Kaizen at Toyota, *Okayama University*.
[3] Palmer V S (2001), "Inventory Management Kaizen", *Proceedings of 2nd International Workshop on Engineering Management for Applied Technology*, pp. 55-56, Austin, USA.
[4] Wormack J.P., Roos D., and Jones D.T. (1990), The Machine that changed the World, *Macmillan*
[5] Ohno T. (1988), Toyota Production System: Beyond Large-Scale Production, *Productivity Press*, Cambridge (Japanese version, 1978)
[6] Suzaki K (1987), The New Manufacturing Challenge-Techniques of Manufacturing Systems, *John Wiley and Sons, Inc.*, New York.
[7] Teian K (1992), Guiding Continuous Improvement Through Employee Suggestions, *Productivity Press, Portland, US.*
[8] Deniels R C (1995), "Performance Measurement at Sharp and Driving Continuous Improvement on the Shop Floor", *Engineering Management Journal*, Vol. 5,No. 5, pp. 211-214.
[9] Womack J P and Jones D T (1996), *Lean Thinking*, *Simon & Schuste*r, New York.
[10] Jagdeep Singh and Harwinder Singh, Kaizen Philosophy: A Review of Literature, *The Icfai University Journal of Operations Management*, Vol. VIII, No. 2, 2009.