

A CASE STUDY ON APPLICATION OF KAIZEN IN INDUSTRY

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Abstract - Many manufacturing companies in India suffer several problems like high cycle time, more rejections, incomplete orders, compromised quality, low safety assurance etc. KAIZEN is a Japanese lean production tool which helps in attaining continuous improvement in the company environment. The main objective of any industry is to produce the products with higher productivity with using available resources. Application of KAIZEN provides elimination or reduction of different types of wastes in an industry resulting in better overall efficiency of the organization. The case study of implementation of kaizen in core shop in a foundry is done.

Key Words: Kaizen, Lean production, Productivity

1. INTRODUCTION

Kaizen (改善) is the Japanese word for "improvement". In business, kaizen refers to activities that continuously improve all functions and involve all employees from the CEO to the assembly line workers. It also applies to processes, such as purchasing and logistics that cross organizational boundaries into the supply chain. It has been applied in healthcare, psychotherapy, life-coaching, government, and banking.

By improving standardized programs and processes, kaizen aims to eliminate waste. Kaizen was first practiced in Japanese businesses after World War II, influenced in part by American business and quality-management teachers, and most notably as part of The Toyota Way. It has since spread throughout the world and has been applied to environments outside business and productivity.

KAIZEN Mission: Significant continuous improvement in performance through elimination of all waste of time and resources in our operations.

1.1 Theoretical background and literature survey

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 speaks 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

Some related terms

1. Kaizen It is a Japanese term for "improvement", or "change for the better" refers to philosophy or practices that focus upon continuous improvement of processes in manufacturing, engineering, and business management. By improving standardized activities and processes, kaizen aims to eliminate waste.

2. Productivity The ratio between output and input is known as productivity. It may also be defined as the arithmetic ratio of amount produced to the amount of resource used in any production. The resource may be land, plant, labor, material, machines, tools or it could be a combination of all.

3. Cycle Time It is defined as the actual time taken to complete a set of activities (one cycle).

4. Takt Time It is the theoretical time allowed to produce one product ordered by customer. It can be determined by ratio of net available time by customer demand. $Takt\ Time = \frac{\text{net available time}}{\text{customer demand}}$. It is used to match the pace of production with customer demand.

5. MUDA'S It is a Japanese term which means anything that increases the cost but creates no added value. There are basically seven types of MUDA's: • Muda of over-production • Muda of waiting • Muda in transportation •

Muda in processing • Muda of inventory • Muda of motion
 • Muda of defective parts and reworking

6. **MURI MURI** is a Japanese word for overly hard work or the strain. It is an important factor that helps in determining the productivity

Principles in KAIZEN

1. **Get rid of old assumptions.** Keep an open mind to change.
2. **Don't think of excuses.** Think of ways to make it happen.
3. **Say "No" to the Status quo.** Question the status quo by constantly asking "Why?"
4. **Find MUDA! Find WASTE!** The most damaging kind of waste is the waste we don't recognize.
5. **Don't worry about being perfect.** A 60% chance of success is good enough- Implement your idea now! You can change or refine your solution based on the facts that result from implementing it right off.
6. **Stop doing it wrong, and start doing it right-just now!** Eliminate "buts" from your statements like "We know that it is not right, but..."
7. **It does not cost money to do KAIZEN.** Do not plan on spending big money. Good ideas come when the going gets tough.
8. **Seek out the true cause.** Don't be satisfied with causes that come to your mind easily. Ask "WHY" at least 5 times to discover the roots of the problem. Only then ask "HOW do we fix it?", and put the solution into the practice right away.
9. **Ten heads are better than one.** Team work is the key. Wisdom and creativity that comes through the efforts of 10 people is more valuable.

10. **KAIZEN is endless.**

There are five 5S phases. They can be translated from the Japanese as "sort", "set in order", "shine", "standardize", and "sustain". Other translations are possible.

Seven Categories of waste

1. **Overproduction:** Central waste that leads to all other forms of waste. Unlike other wastes, which provide clues for correction, waste arising from overproduction overshadows other wastes preventing us from making improvements.

2. **Inventories**

3. **Defective products, Scrap, repair, rework**

4. **Waiting-time, watching-time, walking-time, down-time, start-up, set-up change and adjustment times, searching time**

5. **Unnecessary motion and movements**

6. **During processing itself:** Speed losses, idling and minor stoppage, leakage of compressed air, oil and coolants, tool breakages, avoidable consumption of electricity and water etc.

7. **Transportation, Conveyance**

2. KAIZEN ACTIVITY

A case study was conducted in a XYZ foundry. Kaizen was implemented in core shop of the foundry.

Kaizen 1

Cores are used for making hollow parts in casting process. They are generally made up of resin coated sand. Cores have less strength and get broken when fall down while handling or during transport. The transport of these cores is extremely sensitive as cores are brittle and are costly. The cores having cylindrical orientation are generally broken because of their orientation. These mostly include hub shell cores. Before kaizen, the hubs were placed horizontally on the trolley surface one next to the other without any support so there was less stability. This led to rejection of many hub cores. In the kaizen we suggested making holes of dimension of outer diameter of the hub with some tolerance so that the hubs can be mount vertically. The dedicated trolleys were made for cylindrical shaped cores by making circular cavity on the trolley platform. This led to better stability, ease to handle, less core rejections and improved trolley capacity.



Trolley modification for front hub main shell cores			Shop/ Area: Core Shop	
Operation	Problem	Root Cause	Measure Taken	Result
Core trolley movement	Breaking of cores due to cylindrical profile	Improper placement of the core • Pot holes • Unskilled worker	Dedicated trolleys for front hub main shell by making circular cavity on trolley surface to hold the hub	• Better stability • Easy to handle • Lesser chances of breakage of cores • Capacity of trolley increased
Before			After	
				

Figure 1. Kaizen of hub cores

Kaizen 2

Second kaizen was implemented for engine housing cores. These are comparatively heavy as compared to the other core and one of the most important cores in the foundry. The housing cores are also the most expensive parts in core shop. Before the implementation of kaizen, operators used to convey the housing in three storied trolley as shown in the figure. While transporting, the cores at the topmost platform used to fall down and get rejected because of the vibrations due to potholes in the way. In kaizen we suggested making a dedicated two storied trolley as shown in figure. This led to better stability and less rejection of the cores.

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Trolley modification for Housing assembly			Shop Area: Core Shop	
Operation	Problem	Root Cause	Measures Taken	Result
Core trolley movement from storage to molding line.	Breaking of cores due to more height of the trolley.	<ul style="list-style-type: none"> More height Potholes Unskilled worker 	Dedicated trolleys for Housing assembly with 2 compartments for better stability	<ul style="list-style-type: none"> Better stability Easy to handle Lesser chances of breakage of cores
Before				
				

Figure 2. Kaizen of housing cores

3. CONCLUSION

Implementation of KAIZEN provides improved productivity, efficiency, reduced lead time, reduced cycle time, reduction in waste, improved safety in the KAIZEN implemented environment, immediate troubleshooting, optimum utilization of resources, improved teamwork, improved employee satisfaction. The implementation of kaizen in core shop was a success as it led to more efficient and productive process with lesser rejections.

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