Improvement of Operational Efficiency in a Water Heater Manufacturing Plant through Continuous Improvement Techniques

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Abstract
By appropriate selection of Quality tools and Techniques, Continuous quality improvement are often achieved in organizations. The very key challenge of Continuous Improvement implementation is making people participate within the CI Programmes. This paper focuses on a true time industry problem during a hot-water heater manufacturing plant. The identified problem during this research work was subjected to continuous improvement tools like RCA- Root Cause Analysis and Fish Bone Diagram to spot the factual explanation for the matter. It had been identified that Man and Method factors were the 2 key factors contributing to the detoriation of the finished goods quality and suggestions were provided to beat an equivalent .

Keywords: continuous improvement, kaizen, root cause analysis (RCA), fish bone diagram (FBD)

Introduction

The study was observed in India's largest water heater manufacturing company with their total production 4 lakhs water heater in the year of 2019. The company produces more than 1200 water heater per day in their plant. For their unbelievable success of the company they followed various quality tool like 5S, just in time, lean management While there are many important quality management principles, here we discuss about continuous improvement. By constantly looking for methods of improvement, the company and the employees both get benefits out."Continuous improvement, is additionally called as continual improvement process, is that the non-stop improvement of products, services or processes through breakthrough improvements. These efforts can search for "incremental" improvement over time or "breakthrough" improvement all directly."

Concept of Continuous Improvement Techniques

The word Kaizen springs from Japanese word, which suggests continuous improvement. Kaizen could also be a view point that defines management's role in continuously inspire and implementing tiny improvements involving everyone. It is one of the method of continuous improvement in tiny increments that make the tactic more efficient, effective, in check, and adaptable. It stresses on improvement, which is completed to reinforce process framework. Kaizen means on continuous improvements as compared to onetime improvement, which is nothing but innovation. It's classified as – productivity, quality, cut, delivery, safety and morale. There are four basic steps, which help within the higher implementation of Kaizen. The four step are called as PDCA – Plan, Do, Check and Act.

The main objective of Kaizen is to enhance productivity, reduce waste, and eliminate unnecessary diligence. Kaizen identifying the three basic sorts of waste: Muda, Mura and Muri.

Toyota has developed its production system around eliminating three enemies of Lean: Muda, Muri and Mura.

MUDA, are often defined in eight types, seven defined by Toyota and 'non utilized skills'. These are Defects, Overproduction, Waiting, Non-used Talent, Transport, Inventories, Movement and Excess processing. There are numerous tools available to spot and take away waste from your process, which cover Poke Yoke, Kanban, Takt Time, SMED and One-Piece flow. The foremost useful

gizmo that helps to enhance productivity by removing all 7 wastes, however is 5S.

MURI, overburden, may result from Mura, and from removing an excessive amount of Muda from the method . When operators or machines are utilized for quite 100% to end their work, they're overburdened. This suggests breakdowns when it involves machines and defection when it involves employees.To enhance the utilization of machines and confirm they function properly, preventative and autonomous maintenance are often implemented. To stop overworked employees, safety should be the main target of all process designs and every one standard work action.

The subsequent may be a list of examples where unevenness could arise and cause problems:

- Uneven customer demand
- Inventory swings – from an excessive amount of to insufficient
- Uneven production speed or changing production quantities
- Uneven quality of excellent parts (however, if the part fails or has got to be scrapped it's waste)
- Irregular or erratic working rhythm
- Uneven training of the workers
- Uneven distribution of the workload

MURA, unevenness, are often found in variation in customer demand, process times per product or difference of cycle times for various operators. In production environments with low-volume, high product difference, flexibility is more important than in high-volume, low-product difference environments. When Mura isn't decrease, one increases the likelihood for Muri and thus Muda. Mura are often lower by creating openness within the supply chain, change product design and make standard work for all operators. However, it can also implement to materials, machines, and organizations. Here are a couple of examples:

People

- Working too long hours
- Work
- Unsuitable posture or inadequate ergonomics
- Noise
- Too-difficult tasks
- Too-easy tasks (which could also be boring or mentally tiring)
- Excessive stress
- Anything that results in blow out , bore out, or repetitive strain injury
- Lack of coaching
- Humiliation, but possibly also excessive praise
- Dangerous, dirty, and difficult tasks (the 3K in Japanese)

Organizations

- Demanding that the supplier delivers what we would like whenever we would like it without providing an honest and stable signal from our side
- Abusing your market power to fleece suppliers or customers (I feel this temptation could also be difficult for several companies within the western world to avoid)

Machines and Materials

- Pushing machines and tools to the bounds of its capabilities, resulting in increased wear and tear
- Skipping maintenance (you can skip an car care in your car, but your car won't like it)
- Mistreatment of materials; e. g., storing parts in unsuitable conditions
- Loading a vehicle or container beyond its weight limit.

The Kaizen Process

Kaizen starts with a drag, more expressly the popularity that a drag exists which there are opportunities for improvement. Once problems are identified, the organization must gather the cross-functional personnel to know the underlying explanation for it. The suggest solution are then tested on a small-scale. Using data, the team makes modify to the answer and eventually, the results are outstretch across the organization and therefore the solution is standardized.

The continuous improvement cycle of Kaizen activity has six phases:

1. Identify a drag or opportunity
2. Analyse the method
3. Develop an optimal solution

4. Implement the answer
5. Study the results and adjust
6. Standardize the answer

The Operational Problems Identified

Over continuous observations and series of time study analysis for three months, study about the rework occurs on production and assembly section of water heaters and eliminating waste, improving productivity, and achieving sustained continual improvement, the major problems identified in the produced goods is due to High Voltage Problem

Applying Root Cause Analysis for the Problems

The root cause method is best away to find out critical cause for the problem. In this analysis the causes of high voltage problem are identified by using the kaizen tools like 5 why analysis.The 5why analysis is used to identify the causes of problem in different aspect asking question directly to the worker in that place. A lot of causes were found behind the high voltage problem,that should be framed as the why? For every why? There should be a solution that why and then ask the next why question. This question and answer tic-tac-toe continuous until everyone agrees the root cause is found.

In this 5why analysis, the first why? Why the high voltage is occurs? From that why the cause identified was because of moisture content occurs on the inner door of the water heater. And the second why? Why moisture occurs on the inner door? From the second why the cause identified was because of the part of leakage test it should not be drain properly and subsequently the third why was put forth, Why it should not be drain properly? From the third why it is found that the operators have lack of awareness about the effect. And the fourth why was raised, As why they have lack of awareness? It was identified that is due to in the time of peak production the new workers are involve in the drain and sorting the water heater. At last the final why was asked as why new operators are involved in that process? It is found that the time management want to finish the target within the peak season time.

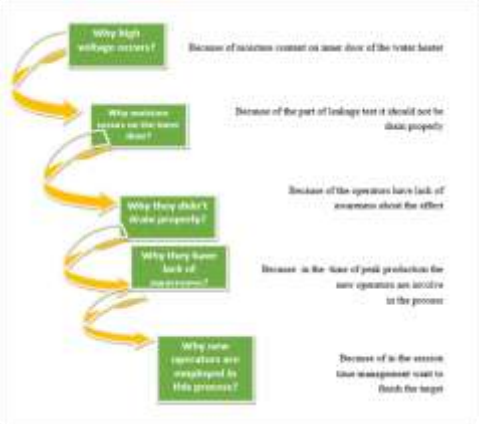

Fig.1 Applying 5 Why technique for the problem

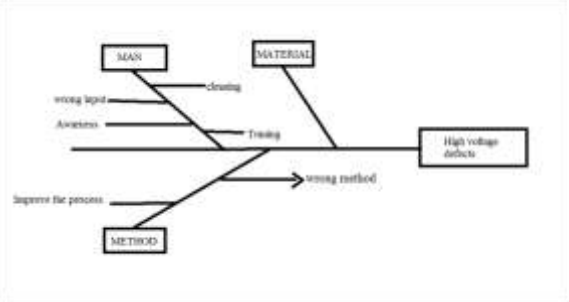

Fig.2 Obtaining the core cause of the problem

Findings and Suggestions

- It is found that the majority of the problem is due to the MAN Factor. The clear evidence of lack of training and awareness about the process was the main factor that has lead to unaccepted quality of finished goods. Hence proper induction needs to be given to the new joiners and more frequent hands on training must be provided to the workers in the production line.
- Deployment of new workers in the production line is also a key factor that helps in on quality produced goods. Hence it is suggested that new workers can be deployed in production line after series of training and observations of their performance.
- Also in the METHOD Factor, it is seen that the new workers who are deployed, unknowingly starts following the wrong work practices, which has lead to the production of finished goods with poor quality.

References

1. Theory and practice for the implementation of 'in-house', continuous improvement participatory ergonomic programs, Marla C.Haimsa1 Pascale Carayona, Applied Ergonomics Volume 29, Issue 6, 4 December 1998
2. Dynamic capabilities through continuous improvement infrastructure,Journal of Operations Management, Volume 27, Issue 6, December 2009
3. Sustainable production: The ultimate result of a continuous improvement, International Journal of Production Economics, Volumes 56–57, 20 September 1998
4. Integrating six sigma and theory of constraints for continuous improvement: a case study Ike Ehie, Chwen Sheu, Journal of Manufacturing Technology Management, 2005
5. Basu, R. Implementing Quality – A Practical Guide to Tools and Techniques, Thomson Learning, UK, 2004.