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PROCESS IMPROVEMENT BY IMPLEMENTATION OF KAIZEN AS A QUALITY TOOL WITHIN DEFINED CONSTRAINTS: A CASE STUDY IN MANUFACTURING INDUSTRY

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Abstract

Kaizen is a concept that focuses on improving a work area or an organization in incremental steps. The first well-known and most frequently cited proponent of kaizen was Imai, who wrote KAIZEN – The Key to Japan’s Competitive Success (1986). This paper illustrates about kaizen case study in Small Medium Industries (SMI) Company that is ABC Company, which produce non woven fabrics. This case study is focused on reducing material wastage. Kaizen steps are used as guidelines and PDCA Cycle is choosing as problem solving approach to conduct the

case study. The properly tools and techniques such as why, Work Instruction Sheet, Pareto diagram, Process Mapping, PDCA Cycle and brainstorming were used. The kaizen implementation has reduced the of time losses More than that, sales order processing lead time and production lead time was also reduced. These results have proved the effectiveness of kaizen methodology.

Keywords

Kaizen, Continuous Improvement, PDCA Cycle.

1. Introduction

Kaizen is a concept that focuses on improving a work area or an organization in incremental steps by eliminating waste. Kaizen can be applied to any area in need of improvement. Industries especially manufacturing is currently faced with the conflicting pressure to improving customer satisfaction and service as well as pressures of cost reduction, reducing lead time, and quality improvement in order to get better results. This study is thoroughly focus on reducing time losses while at the same time reducing his lead time of sales order processing in ABC Company and indirectly improves customer satisfaction. Three objective of the study is set which to identify time losses at production area identify opportunities for kaizen improvement using a problem solving approach and describe the effects of the improvement using time measurements.

In today's business environment, the pressures on manufacturing companies to compete on the global arena have been increasingly intensified. Requirements on production capabilities such as quality, cost, delivery capability, and flexibility have become severe to an ever greater extent. Moreover, changes inside and outside of production have become more dynamic and complex. Production is challenged to handle and benefit from, for example, high fluctuations of production volumes and variances, shorter product life cycles, shorter lead time of product realization, rapid technological advancement, corporate mergers and acquisitions, and changes of laws and regulations. Under such circumstances, companies must ensure constant and strong development of the production. Such development is especially necessary for the companies that have the production in high wage countries.

Literature Review

The definition of Kaizen by Imai (1986, 3) is “ongoing improvement involving everyone, including both managers and workers.” The Kaizen philosophy assumes that our way of life- be it our working life, our social life- deserves to be constantly improved. Basing on the parts of the author’s results of India observation trip during December 2013- May 2014, the Kaizen activity could enhance the samples’ process and performance. The results of this mentioned performance are illustrated as follows under the terms of the concept of time value of money and net present value (NPV), which have been generally used in financial and industrial decision- making processes. The incremental net present value’s tool was applied in order to compare the process performances in terms of present value of money between the operation without Kaizen (the PDCA cycle/ the PDCRA cycle) and the operation with Kaizen (the PDCA cycle/ the PDCRA cycle).

According to Shingo (1981: 98), the concept of Just- In- Time should be translated into Japanese word “timely or well- timed”. The partial term of “In- Time” has not much meaning but the partial term of “Just” processes significance. For the scholar’s opinion, even if “Just” is added to “Timely” or “Well timed”, it does not mean “Precisely or exactly timed”, so it must be expressed as “Just- On- Time”, which is “exactly at the appointed time”. Later, according to Imai (1986: 88), the concept of “Just- In- Time” means that the exact number of required units is brought to each successive stage of production at the appropriate time. Putting this concept into practice meant a reversal of the normal thinking process. Ordinarily, units are transported to the next production stage as soon as they are ready. Oh no, who pioneered Toyota’s unique system, reversed this idea that each stage was required to go back to the previous stage to pick up the exact number of units needed. This resulted in a significant decline in inventory levels.

Case Study

In this Industry woven cotton the process were evaluated by the Kaizen principles. The kaizen step is the method to develop Kaizen projects, and follows PDCA approach. All improvement projects, despite of their nature (costs, quality, safety, ergonomics, environment, logistics, etc.) must follow specific guidelines which are defined within kaizen step. Guidelines mean what project type, operating steps and tools to be used and way of using them.

Manufacturing Process in ABC Industry

Process for manufacturing is:

- Needle Punching
- Ranging from “Low Stitch Density to High Stitch Density”
- Thermal Bonding
- Chemical Bonding

Distinctiveness

- Fabric Width Range : 1000 mm (1.0 mtr) to 6500 mm (6.5 mtr Highest in India)
- Gsm Range : 40 gsm to 1000 gsm
- Fiber Processed : Polyester, Polypropylene, Viscose and Acrylic

Needle Punching

Needled punching depends on the precise action of thousands of barbed needles to physically interlock cross-lapped layers of well blended and carded fibers to create materials with Particular properties.

Chemical and Thermal Bonding

- With chemical bonding, after fibers are processed into a web or fabric, the material is saturated in a chemical bath and then dried and heat-cured.
- Thermo bonding may be used to further adhere fibers that have been processed into a web or fabric by adding heat and pressure, creating a unique bond throughout the textile.

Kaizen Methodology

Step 1: Define Pilot Area - Define pilot area is the first step towards ongoing with the improvement activities. Bottleneck processes are commonly defined the pilot area. In order to find the bottleneck process, the business general procedures as well as sales order processing flow is mapped starting from order enter until delivery and payments from customer.

Step 2: Identify Losses - Basically, losses are identified from abnormality. In this project, we choose to focus on total loss of time. This is the problem that we observed in the line. Other losses are not visible. This is because the company is project type based.

Step 3: Organizing Team – In this step the team are put together and expected to come up with a solution to a problem and success in the project conducted. Target is set due to project planning and project schedule.

Step 4: Project Implementation - At this step, PDCA Cycle was used as problem solving approach. Problems are solved more effectively when used the systematic approach. In PDCA approach, there have 7 steps that need to follow. Step by step was followed without skip.

- *Define the problem*
- *Detect root cause*
- *Data collection*
- Data already collected before started kaizen steps.
- *Implement Solutions*
- *Check and Monitor Results*
- *Standardize solutions*

Step 5: Conform Effectiveness - In this step, the effectiveness of kaizen steps and problem solving approach is defined by using comparisons between before and after implementation.

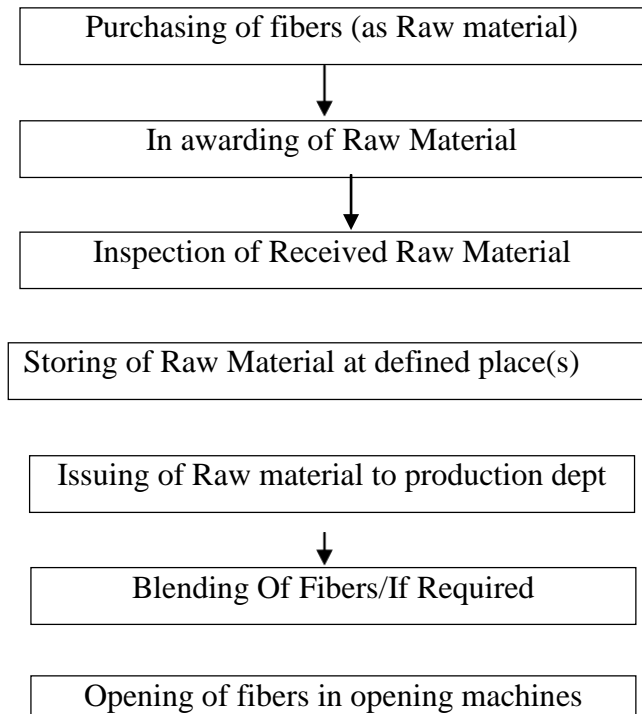
Step 6: Follow Up - In this section, in order to make sure the processes are operating at normal condition even after implementations, some actions have been taken. The actions taken will provide stability and reliability to the improvements that have been carried out. The actions taken are as follows:

- Check sheet
- Workers involvement
- Top management strict enforcement



Figure 1: Actual Photo of various processes from actual site of ABC Company

Process flow diagram with OCPs (Quality Check Points)



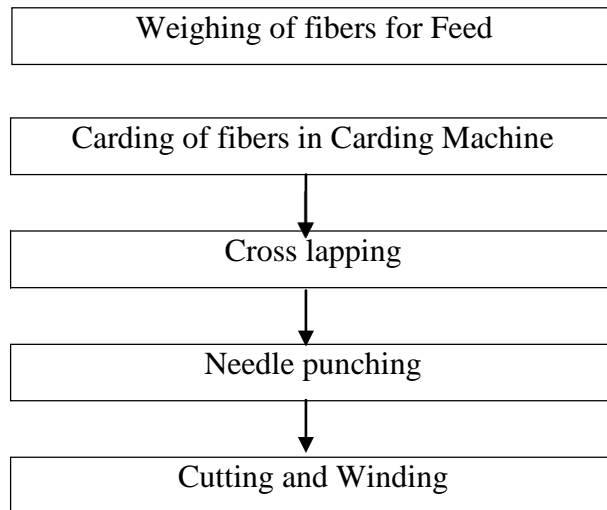


Figure 2: *Process flow diagram*

Table 1.1: *Described Production Flow Diagram with QCPs*

Steps	Process Name	About Quality Check point	Do's & Don'ts Requirement	Record Requirement
1.	Purchasing of Fibers (as Raw Material)	YES need to Place QCP Over here at this process	YES need to place Some Do's & Don'ts as work instructions Over here at this process	YES need to Place one record Over here at this process to control & monitor
2.	In-wording of Raw Material	Not Required	YES need to place Some Do's & Don'ts as work instructions Over here at this process	Not Required
3.	In-coming inspection of Received Raw	Not Required	YES need to place Some Do's & Don'ts as work instructions Over here at this process	Not Required

	Material			
4.	Storing of Raw Material at defined place(s)	Not Required	YES need to place Some Do's & Don'ts as work instructions Over here at this process	Not Required
5.	Issuing of Raw material to production dept.	YES need to Place QCP Over here at this process	YES need to place Some Do's & Don'ts as work instructions Over here at this process	Not Required
6.	Opening of fibers in opening machines	Not Required	YES need to place Some Do's & Don'ts as work instructions Over here at this process	Not Required
7.	Colorings of fibers as per customer requirements	YES need to Place QCP Over here at this process	YES need to place Some Do's & Don'ts as work instructions Over here at this process	Not Required
8.	Weighing of fibers for accuracy	Not Required	Not Required	Not Required
9.	Carding of fibers	YES need to Place QCP Over here at this process	YES need to place Some Do's & Don'ts as work instructions Over here at this process	Not Required
10.	Cross	Not Required	YES need to place	Not

	lapping		Some Do's & Don'ts as work instructions Over here at this process	Required
11.	Again Fine & finfish carding	Not Required	YES need to place Some Do's & Don'ts as work instructions Over here at this process	Not Required
12.	Again Fine & finfish Cross lapping	YES need to Place QCP Over here at this process	YES need to place Some Do's & Don'ts as work instructions Over here at this process	Not Required
13.	In-process inspection	YES need to Place QCP Over here at this process	YES need to place Some Do's & Don'ts as work instructions Over here at this process	YES need to Place one record Over here at this process to control & monitor
14.	Niddle punching / looming	YES need to Place QCP Over here at this process	YES need to place Some Do's & Don'ts as work instructions Over here at this process	Not Required
15.	Web rolling	Not Required	YES need to place Some Do's & Don'ts as work instructions Over here at this process	Not Required
16.	Hessian Punching after proper web rolling	YES need to Place QCP Over here at this process	YES need to place Some Do's & Don'ts as work instructions Over here at this process	YES need to Place one record Over here at this process to control & monitor

17.	Chemical pasting / bonding	YES need to Place QCP Over here at this process	YES need to place Some Do's & Don'ts as work instructions Over here at this process	Not Required
18.	Heating in oven	YES need to Place QCP Over here at this process	YES need to place Some Do's & Don'ts as work instructions Over here at this process	YES need to Place one record Over here at this process to control & monitor
19.	Final inspection	YES need to Place QCP Over here at this process	YES need to place Some Do's & Don'ts as work instructions Over here at this process	YES need to Place one record Over here at this process to control & monitor
20.	Cutting & winding as per customer requirements	YES need to Place QCP Over here at this process	YES need to place Some Do's & Don'ts as work instructions Over here at this process	YES need to Place one record Over here at this process to control & monitor
21.	Packing	YES need to Place QCP Over here at this process	YES need to place Some Do's & Don'ts as work instructions Over here at this process	YES need to place one record Over here at this process to control & monitor
22.	Storing at defined place	YES need to Place QCP Over here at this process	YES need to place Some Do's & Don'ts as work instructions Over here at this process	YES need to Place one record Over here at this process to control & monitor
23.	Dispatch	YES need to	YES need to place	YES need to

		Place QCP Over here at this process	Some Do's & Don'ts as work instructions Over here at this process	Place one record Over here at this process to control & monitor
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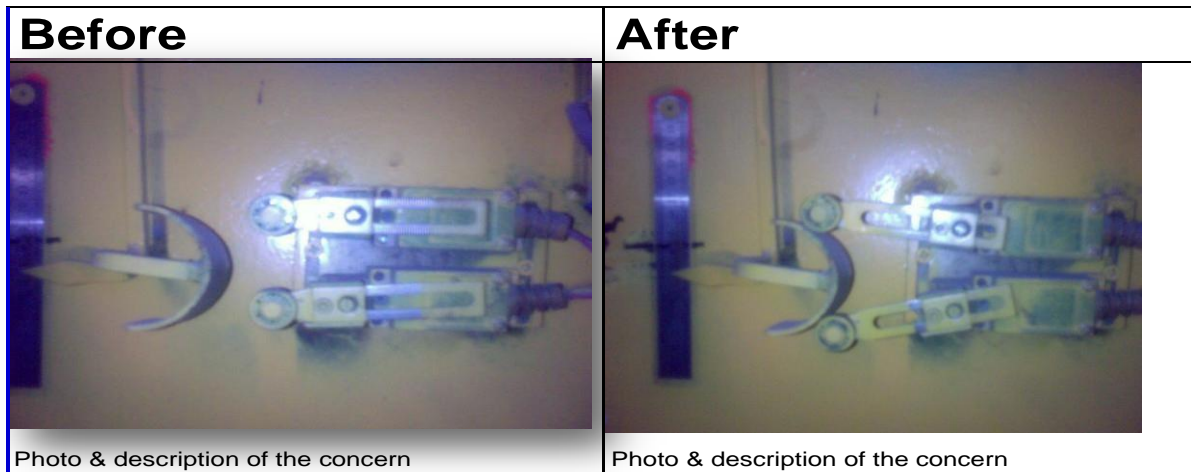


Figure 3: *Compression between actual and ideal*

1.4 Conclusion

The case study conducted at ABC Company is successful. Firstly, the time losses at production was identified which is 15.48 hours. Then, by using PDCA Cycle and some tools, the root cause was identified and improvement solution was proposed. Finally, the effect of improvement was measured by comparison of lead time before and after improvement. Sales order processing lead time was reduced about 6.98% and production lead time reduced about 14.93%. So, all objective were achieved.

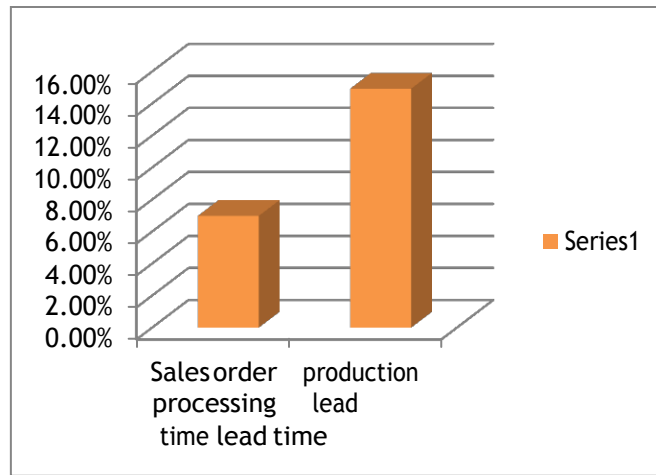


Figure 4: Sales order processing lead time

We can see from this graph that Sales order processing lead time was reduced about 6.98% and production lead time reduced about 14.93%. Kaizen plays an important role in eliminating losses and waste either in production or non production.

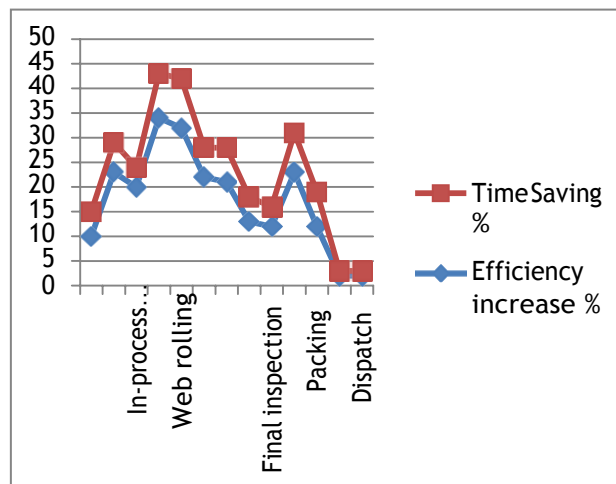


Figure 5: Reduction of time

A slight improvement of 1% is considered a good improvement in workplace. The most important thing in kaizen is make the improvement continuously. To make the continuous improvement in company, firstly is to set the right mindset.

Besides, to gain success in any Kaizen activities, involvement of top management and workers are very significant as illustrated by this paper. An implementation is worthless if workers don't utilize the full potential of it and also if top management doesn't support any of ideas. A clear and sound target to achieve is lit up first following by steps to achieve it, that's

kaizen improvement method.

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