



# Implementation of Kaizen and 5S in Plastic Pipe Manufacturing Unit

Himanshu M. Shukla<sup>1\*</sup> and Kanchan D. Ganvir<sup>2</sup>

<sup>1</sup>*Shri Ramdeobaba College of Engineering and Management, Nagpur, Maharashtra, India*

<sup>2</sup>*Priyadarshini Bhagwati College of Engineering and Management, Nagpur, Maharashtra, India*

\*Corresponding author: kanchan.ganvir100@gmail.com

## ABSTRACT

---

Thousands of small & medium scale industries are present in India. All are facing certain problems resulting in shortage of production and quality issues like productivity, greater lead time, processing time etc. The paper contains basis definition of kaizen philosophy & a brief review of kaizen concept & its implementation. The purpose of this paper is to represent Kaizen, its related terms in a concrete way & its implementation in improving the overall effectiveness of organization. This paper illustrates about kaizen implementation in small manufacturing industry & also focuses on the scenario of Indian manufacturing company while implementing Kaizen. The paper also illustrates the implementation of kaizen technique in a company who is dealing with manufacturing the PVC pipes. The company is currently facing with the problem of increased lead time and backorders. The main objective is to implement kaizen practice in the case company. This implementation is focused on reducing the lead time of sales order processing by mean of which the productivity of organization will be improved. We also suppose to generate case based simulation models which estimate the basic Kaizen implementation process before & after implementation. The tools used are Kaizen, 5S, kaizen sheet 5S sheet etc., and monte-carlo simulation method (for analysis).

**Keywords:** Productivity improvement, quality management, KAIZEN, 5S principles

---

Kaizen is Japanese philosophy which means continuous improvement. ‘Kai’ mean Change & ‘Zen’ mean “Good” the whole purpose of which is betterment of work & improving the organization efficiency. The concept of Kaizen is so deeply ingrained in the minds of Japanese people that they often do not even realize that they are thinking Kaizen. Japanese people uses the inborn instinct of being continuous change present in every human being & work for betterment by using existing resources available within the firm instead of spending lot much money on technologies. The kaizen implementation crucially includes the complete involvement of employees from worker to top level of management in the organization.

Kaizen involve small but continuous improvement & this small change can improve the productivity in huge multiplication .in short Kaizen distinguish as the best method of performance improvement among all the techniques as it involve less implementation cost.

Nowadays, organizations carry on seeking innovative ideas for improving their processes and retaining a competitive edge. 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. Indeed, the overall concept of continuous improvement appears to be applicable to every area of industrial and logistics activity, from the production of basic materials such as steel, aluminum and timber to manufacturing industries as diverse as automotive, furniture, canning, food and drink (Leigh Pomlet, 1994). Many organizations have begun to incorporate the philosophy of kaizen through the use of kaizen methodology. Kaizen project typically focus on specific improvement goals like productivity improvement with small changes & improvement in the working area. The objective is to focus on SMI in India. In this paper we discuss the scenario of Indian SMI & Their work toward the implementation of Japanese techniques Kaizen & 5S. The ultimate objective of Small medium manufacturing industries today is to increase productivity through system simplification, organizational potential and small incremental improvements by using modern techniques. Most of the manufacturing industries are currently encountering a necessity to respond to rapidly changing customer needs, desires and tastes. For industries, to remain competitive in market, continuous improvement of manufacturing system processes has become necessary. Competition and continuously increasing standards of customer satisfaction has proven to be the endless driver of organizations performance improvement. In this project we are dealing with the implementation of kaizen technique for improving the productivity of the company.

## **LITERATURE REVIEW**

Kaizen philosophy embraces three main principles proposed by Imai (1986) which are process orientation, improving and maintaining standard and people orientation. All principles are significant in order to implement the kaizen.

The brief ideas about the three basic principals are:

### **(i) Process orientation**

Imai stated that kaizen is process-oriented. Before results can be improved, processes must be improved, as opposed to result-orientation where outcomes are all that counts. Berger (1997) added to what Imai said that the principle has at least two practical consequences for the improvement process. First, management's main responsibility is to stimulate and support the effort of organizational members to improve processes. In order to be improved, a process must be understood in detail. Second, process orientation calls for evaluating criteria which can monitor and bring attention to the improvement process itself, while at the same time acknowledging its outcome.

### **(ii) Improving and maintaining standard**

Kaizen is distinctive in its focus on small improvements of work standards as a result of an ongoing effort. Furthermore, Imai (1986) said "There can be no improvement where there are no standards" which in

essence denotes the relation between kaizen and maintaining standard procedures for all major operations (Standard Operating Procedures).

### (iii) People orientation

This principle basically referred to kaizen teian where the benefit gained from kaizen implementation can be seen on daily basis by all company employees. This principal simply focused on employee involvement in improvement process.

The main purpose of this paper is to show the basic kaizen implementation approach in Indian SMI. The brief review of papers on kaizen implementation in Indian context is discussed below:

Author	Type & Name of industry	Result
Abhijit Chakraborty, Madhuri Bhattacharya	Front & rear axle manufacturing company	Production rate per hour increases & reduction of lead time
R.T. Salunkhe, G.S. Kamble, Prasad Malage	Irrigation pump manufacturing company	Productivity improvement with less processing time
D Rajenthirakumar & P R Thyla represent	Dead link & centre link manufacturing company	Productivity improve with solving a problem of tube bending assembly line
Zaidahmed Z. Khan, 2,Dr. Sanjay Kumar	Double Window sight flow indicator manufacturing	Manufacturing lead time will be reduced
Pramod Kumar, Vineet Pandey	Wire harness manufacturing company	Productivity improved along with reduction in production cost
Mr. Bhupendra Kumar Daiya	Cement manufacturing plant	Productivity improved with improved human engineering
Gundeep Singh, Dr. R.M. Belokar	Tractor manufacturing company	Productivity improved with reduction in production cycle time
Pratesh Jayaswal & Hemant Singh Rajput	Automobile maintenance part manufacturing company	Productivity will be improved with improved OEE

## IMPLEMENTATION PROCESS

### Company Background

The Modigold Pvt. Ltd. is located in Butibori Nagpur, Maharashtra in India. The major product of the company is PVC & HDPE pipes used for water sprinkling & electric fitting purpose. This company is mainly focused on manufacturing as per customer's specification & requirement. The company currently has a capacity of about 150tonn per month (inclusive of all varieties), total annual sales volume is 5 crores (INR) and total employees are 12. The Company is working in 2 shift & 24 hours. Out of 13 workers 7 workers are working in first shift & remaining on second shift. For implementation of technique we first need to identify that what the management people actually want and after identifying the entire requirement the work will be started. So, we started our work in some prescribed manner.

## Recognition of need:

Before starting the work I have discuss the requirement of the company in future & following are the need recognized from the manager of the company:

1. The top managerial person needs improvement in productivity.
2. The employees of the company need to be involved & concern about organization achievement.
3. Need of reduction in accidental hazards while cutting the required length pipe manually.
4. There should not be too much of capital investment in productivity improvement as the company is batch type & small scale

## Objectives

An objective of this study is:

1. Identify time losses at production area
2. Identify opportunities for kaizen improvement using a problem solving approach
3. Describe the effects of the improvement

## Problem definition

After analyzing the overall scenario of the company, the following are the problems which need to be focused.

1. The company is manufacturing varieties of pipes ranging from 400mm to 10000mm. There is much time involve in maintaining the stock of finish good.
2. The lead time for sales order is higher
3. Production cycle time is more than required.

## Analysis of problem

The following are main causes which serve as a barrier in productivity improvement:

- ❑ Lack of multi skilled development, lack of training to operators, no proper utilization of resources, and Non involvement of staff toward work & improper maintenance of inventory of raw material as well as finished pipes.

## Generation of alternative solutions

To solve the problems following are the possible solutions that I have found:

1. To solve the inventory related problem the electronic KANBAN can be used.
2. The employees can be trained by official trainers.
3. Fully automated machine can be used for improving production cycle time.
4. To solve all the concern problems a small but continuous improvement is employed

## Selection of best possible solution

As the industry's officials already require improvement but with not too much capital investment and as the first three possible solutions required trained operator as well as capital investment I select Kaizen process implementation best suited for the improvement.

## IMPLEMENTATION OF KAIZEN AND 5S

Before actual implementation it is very necessary to study the standard operating procedure for completion of raw material into finished product. The process is shown by process flow diagram shown below:



**Fig. 1:** Company Flow Diagram

## 5 'S' System

Establish and maintain a clean, neat and tidy workplace Translation of 5 Japanese S's, what is 5S and why do we want to do it? 5S represents 5 disciplines for maintaining a visual workplace (visual controls and information systems). These are foundational to Kaizen (continuous improvement) and a manufacturing strategy based "Lean Manufacturing" (waste removing) concepts.

5S	Abbreviation	Keyword
SEIRI	Sort	Arrangement
SEITON	Set in Order	Neatness
SEISO	Shine	Cleanliness
SEIKETSU	Standardize	Flexibility
SHITSUKE	Sustain	Discipline

By applying all principles of KAIZEN and 5S, following changes has been made in the company's layout and working areas.

**Set in Order** A place for everything and everything is in its place. Every material required during the operation like dies, fixtures, tools and equipments are arranged in a sorted manner in a separate and distinguished place. The results are as shown in the Fig. 2.



**Fig. 2:** Maintenance section before and after 5S implementation

**Standardize** Cleaning and identification methods are consistently applied. The improvement process followed by using machine process chart & production plan board is implemented. Apart from this, the standardization of final product is carried out. The pipes are sorted and kept according to different sizes and specifications. The dispatch section is optimized so that while loading the product there should be clarity in specifications of the products to be delivered.



**Fig. 3:** Store area before and after 5S implementation

## RESULTS AND DISCUSSION

### Tact Time calculation before Kaizen implementation

Total Requirement : 1100 pipes (24 hours)  
 Available time : 1440 minutes (24 hours)  
 Lunch break : 40 minutes for both shift operators  
 Tea break : 15 minutes for both shifts  
 Net available time =  $(1440 - 40 * 2 - 15 * 2)$   
 = 1330 minutes/day  
 Tact Time = Net available time/ requirement  
 =  $(1330 / 1100)$   
 = 1.20 minutes  
 = 72.54 seconds.

Thus, Tact Time **72.54 seconds** at every station

Operation	Before	After
	Time (min)	Time (min)
Size changing (a)	180	155
Material preparation time (b)	10	10
Cycle Time (c)	2200	2130
Transportation Time (d)	10	8
Lead time (a+b+c+d)	2400	2303

It is observed from the results that after the implementation of KAIZEN and 5S, the size changing time is reduced by 13.88%, while the cycle time is reduced by 3.18%, and the overall lead time is reduced by 4.04%.

## CONCLUSION

Thus it can be concluded that the implementation of KAIZEN and 5S can be very beneficial as far as the overall growth of the organization is concerned. It reduces the lead time of sales order by almost 4-5% due to which the overall productivity of organization will be improved.

The cycle time also gets reduced by 3-4% by removing the non value added time consuming elements. The 5S ensures the smooth flow of material within the plant due to layout improvement and systematic location of tools and equipments.

As the case study results are obtained after the implementation of KAIZEN, it is also suggested to generate case based simulation models which estimate the basic Kaizen implementation results so that the decision can be taken about the implementation prior to the attempt.

## REFERENCES

1. Abhijit Chakraborty, Madhuri Bhattacharya, 2013. "Importance of kaizen concept in Medium manufacturing industries." *International journal of management & strategy*, **4(6)**.
2. D. Rajenthirakumar, P.R. Thyla. Transformation to Lean Manufacturing By an Automotive Component Manufacturing Company.
3. Mr. Bhupendra Kumar Daiya, 2012. "Applying Gemba Kaizen at SKS Separator in cement plant" A case study. *IOSR Journal of Engineering (IOSRJEN)*, **2(9)**: 01-06.
4. Gundeep Singh, Dr. R.M. Belokar 2012. "Lean Manufacturing Implementation in the Assembly shop of Tractor Manufacturing". *International Journal of Innovative Technology and Exploring Engineering (IJITEE)*, **1(2)**.
5. Vikas Kumar, Dixit Garg & N.P. Mehta 2004. "JIT Concep in Indian Context" *Journal of scientific & industrial research*, **63**: 655-662.
6. R.T. Salunkhe, G.S. Kamble, Prasad Malage. Inventory Control and Spare Part Management through 5S, KANBAN and Kaizen at ABC Industry. *IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE)*, PP: 43-47.
7. Suzaituladwini Hashim, Nurul Fadly Habidin, Juriah Conding, Anis Fadzlin Mohd Zubir, Nurzatul Ain Seri Lanang Jaya 2012. "The Integrated Between Total Production Maintenance Practices And Kaizen Event Practices In Malaysian Automotive Industry" Applications (IJERA) **2(5)**:136-143.
8. Ashmita Joshi. "Implementation of Kaizen as a continuous improvement tool-A case study". *ASM's international e-journal of ongoing research in Management & IT*. e-ISSN-2320-0065
9. Ohno, Taiichi. 1988, "Toyota Production System", New York: Productivity Press.

10. Agrawal, N. 2010. Review on just in time techniques in manufacturing systems, *Advances in Production Engineering & Management*.
11. Dean R. Manna. 2008. Just-In-Time: Case Studies of Supplier Relationships Across Industries, *The Journal of Applied Business Research*, First Quarter.