Case Study
Effects of Lean Tools In Small Scale Enterprises

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Abstract

This paper attempts to focus on effects of the lean tools when applied in small enterprises particularly in manufacturing sector. In this competitive world, muda is to be reduced and the result therefrom is for better productivity and simultaneous cost-curtailment in production sphere of manufacturing. In this paper two tools of lean i.e., kaizen and why-why analysis have been applied over small manufacturing enterprise and its impact on the cost-effectiveness at the shop-floor of various component production has been analyzed to ascertain the lean concept which can be applied in the small enterprises for its betterment & making it competitive in the global market.
Keywords: Quality, kaizen, muda, lean, productivity, why-why analysis.

Introduction

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Micro Small and Medium Enterprises (MSME) contribute employment to 31 million people, 45% of total Industrial Production and approximately 40 % of the total Indian Export. With the newer opportunity of Service Enterprises and global competitiveness in manufacturing enterprises Indian MSMEs are passing through a new business environment and challenging economic scenario. West Bengal is none the less away from this changing phase. Rather the picture is different when MSMEs here have caught up with the global standard of excellence in order to remain competitive and profitable. The MSMEs, therefore, have adapted to new standards in technology, quality and pricing to survive in the market. Haldia downstream industries, North Bengal tea Enterprises, Chemical based Industries throughout the state, Engineering Enterprises in Howrah district – broadly accepted that there is no way until and unless they keep symbiotic relationship with their large Corporate. Thankfully, with the advent of high-speed communication medium, the message has been propagated in right direction. Government encouragement to promote Quality Standard System for Small Enterprises started late from 1997. Now for micro enterprises irrespective of products or services they understand the benefit to implement this for survival in the market.

Lean manufacturing is the progressive way of thinking of the produce what the customers want, when they want it, and at what value they are going to pay for it and at the same time the manufacturers use least resource. It was the concept of manufacturing in Automobile sector up to 1970s. Thus there is also other way of defining productivity at customer front and optimizing the profit as well as protection of enterprise in highly competitive market. Lean is the set of Tools that assists in the identification of Value, Waste and to keep flow of enterprise. We can find that country like Malaysia has included in its third industrial master plan this advanced Quality tools for the development of SME Sector.

There are multiple ways to operational philosophy of lean manufacturing. Lean production utilizes a specific set of factory

practices that facilitates small-lot-production with minimum buffers and a corresponding rapid feedback process when there are problems. As such, lean facilities typically have very small process rework areas as compared to plants not applying lean concept.

Government Policy towards Lean Implementation

National Programme on application of Lean Manufacturing Scheme approved for implementation of 100 Mini Cluster under Public Private Partnership Mode Since 2008-09. Approximately Rs. 35.00 Crore fund is allotted towards activities covering Popularizing the scheme, Preparation of Directory of Lean Manufacturing Consultants, identifying potential Clusters. In the policy, lean intervention will be to assist MSME units to reduce their manufacturing Cost through stipulated process flows, reduced engendering time, Proper Personnel Management, better space utilization, Scientific Inventory Management. Lean Manufacturing Counselors will act to identify and implement appropriate lean Manufacturing tool & techniques in selected clusters.

In West Bengal, so far 11 Clusters have been identified from various product group like-Food Processing, Light Engineering, Ready-made Garments, Tea Processing, Leather Goods, Foundry. Out of these 10-12 Mini Cluster Units- 2-3 Clusters have already started implementing the Scheme at Shop-floor Level.

In this paper the authors attempt to find out to what extent lean tools application in small scale industries manufacturing sector is going to have an impact for the betterment of quality, productivity and cost curtailment in the production of the different components of the pumps being manufactured by Moonlight Industries for lifting petroleum products from petrol pumps.

Literature Review

Principles of lean thinking have been broadly accepted by many manufacturing industries and have been applied successfully across many disciplines (Poppendieck, 2002). Different authors define it

differently. Lean manufacturing is frequently associated with the elimination of seven important wastes to improve the effects of variability in supply, processing time or demand (Shah and Ward, 2007). Liker and Wu (2000) defined it as a philosophy of manufacturing that focuses on delivering the highest quality product on time and at the lowest cost. Worley (2004) defined it as the systematic removal of waste by all members of the organization from all areas of the value stream. Briefly, it is called lean as it uses less, or the minimum, of everything required to produce a product or perform a service (Hayes and Pisano, 1994). In a nutshell, lean manufacturing can be best defined as an approach to deliver the upmost value to the customer by eliminating waste through process and human design elements.

Lean manufacturing has become an integrated system composed of highly inter-related elements and a wide variety of management practices, including Just-in-Time (JIT), quality systems, work teams, cellular manufacturing etc (Shah and Ward, 2003). The purpose of implementing it is to increase productivity, reduce lead time and cost, and improve quality (Sanchez and Perez, 2001; Karlsson and Ahlstrom, 1996).

Lean manufacturing requires not only technical aspects should be fully understood, but existing relationships between manufacturing and the other areas of the firm should also be examined in depth, as should other factors external to the firm (Womack and Jones, 1994). As an integrated concept, the adoption of lean manufacturing can be characterized by a collective set of key areas or factors. These key areas encompass a broad range of practices, which are believed to be critical for its implementation. They are inventory, material handling, equipment, work processes, quality, employees, layout, suppliers, customers, product design, management and culture, and tools and techniques (Wong, 2009).

Methodology

In this paper we have analyzed through the case-study in MSME sector wherefrom we will see that using this effective tools how MSME sector in this state is slowly gaining pace in economy and augmenting the market share. The case-study will reveal

- the extent of implementation can be done in Micro Small and Medium Enterprise
- Benefit associated with integration of these tools in the manufacturing line
- Cost effectiveness of the use of the tools
- Other areas where these tools can effectively be used to strengthen the MSME sector of West Bengal.

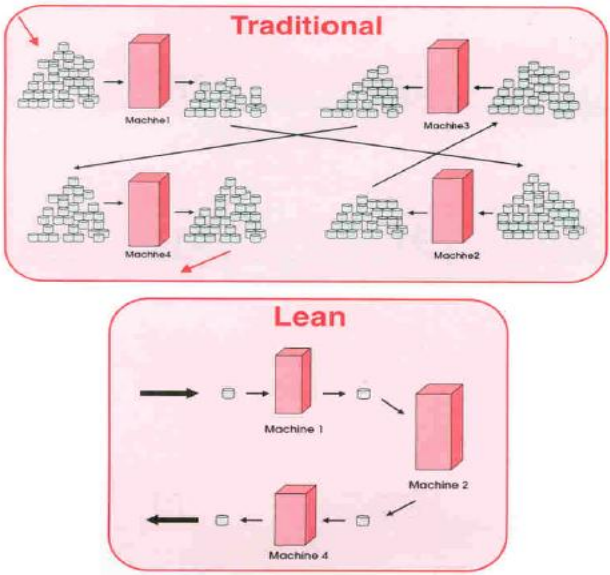
Case: Taken from Small Manufacturing Enterprise where Kaizen tools are used in various sections in the shop floor through Total Employee Involvement (TEI) and effect of use of the tool is analyzed from the angle of both physical and financial achievement.

The Principles of Lean Thinking

Achieving the Lean Enterprise requires a departure from traditional thinking. Lean Enterprise thinkers will:

1. Define value precisely from the perspective of the end customer, in terms of a specific product, with specific capabilities, offered at a specific price and time.
2. Identify the entire value stream for each product and eliminate waste.
3. Make the remaining value-creating steps flowing.
4. Design and provide what the customer wants only when the customer desires it**.**
5. Pursue perfection.

Fig.1



Overview of Kaizen Philosophy

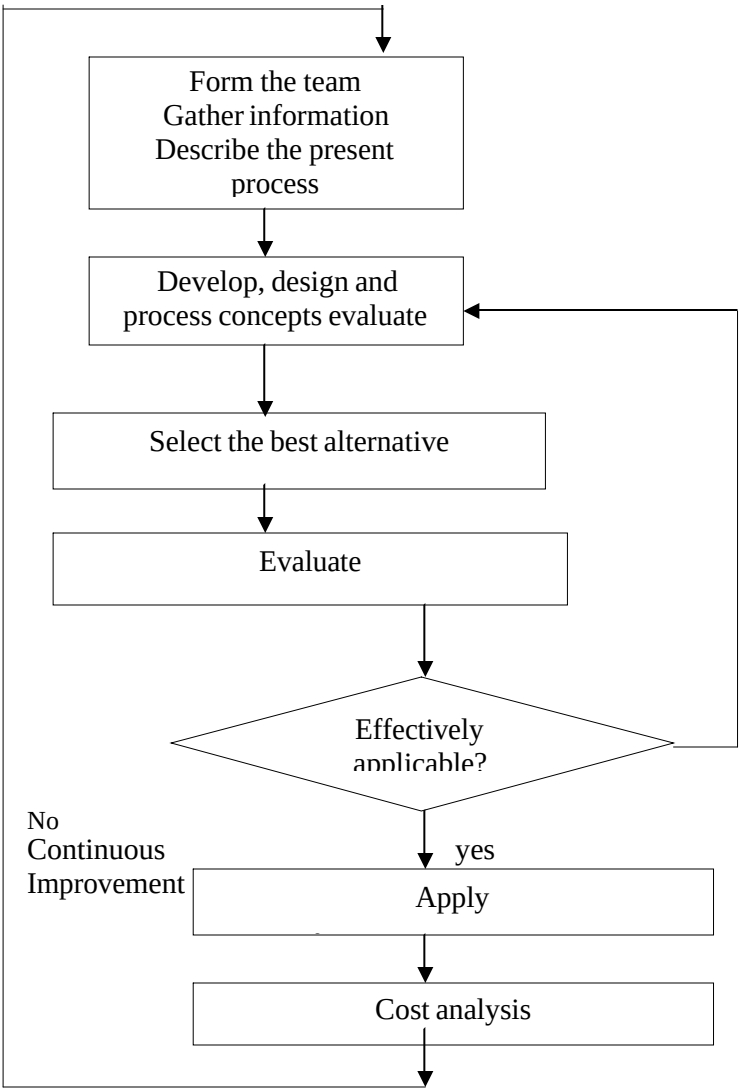
According to Imai (1986), Kaizen means "continuous improvement". Not just a philosophy of the workplace, it means continually improving in every facet of life, including business, industry, commerce, government, and diplomacy, among others. In full Kaizen, training has focused on both philosophical and cultural concepts and is based on the belief that the development of an individual's skill benefits both the company and that individual, and that people constantly achieve self-improvement (Imai, 1986).

This declaration contains elements of the famous motivational theories developed by Abraham Maslow (Chester, 1994). Womack and Jones (1996) describe Muda as any human activity that absorbs resources but creates or adds no value to the process. Most employees could identify several different types of muda in their workplace, but unfortunately the waste that they identify is only the tip of the iceberg. The authors continue by stating that until these employees have been taught the essentials of lean thinking, they are unable to perceive but a few types of the waste actually present in their environment. The benefits of undertaking this process are also to be discussed. Then, we are to begin with the formation of a Kaizen team that is responsible for the product, while also carrying responsibilities for the consideration of the process. In this step, the facts of the process and the direction for improvement are examined. This aforesaid informations will be used in the next step for doing the requisite analysis.

Kaizen Procedure

Depending on the objectives of the improvement, there are many ways to implement the Kaizen procedure. The flow chart, shown in Figure 2 depicts the way.

Figure 1: Kaizen Procedural Flow Chart



Why – Why Analysis

It is a method of questioning that leads to the identification of the root cause(s) of a problem. A why-why analysis is conducted to identify solutions to a problem that address it's root cause(s). Rather than taking actions that are merely band-aids, a why-why helps one to identify how to really prevent the issue from happening again. This type of analysis is very effective in a team setting or with more than one person involved.

The 5-Why analysis method is used to move past symptoms and understand the true root cause of a problem. It is said that only by asking "Why?" five times, successively, one can explore into a problem deeply enough to understand the ultimate root cause. By the time you get to the 4th or 5th why, one will likely be looking squarely at management practices. This methodology is closely related to the Cause & Effect (Fishbone) diagram, and can be used to complement the analysis necessary to complete a Cause & Effect diagram.

Case Study

The Moonlight Engineering Industries, at Rajpur, 24 Pargana(S), West Bengal coming under small manufacturing enterprise producing oil dispensing pump and supplying it to different parts of the country. To compete with the oil company giants, they started application of lean tools in their manufacturing unit to reduce the wastage and improve the productivity within the existing facilities. In primary stage they have identified shop floor as the project area and Kaizen as lean tool.

In Kaizen- means 'change' for 'good' that was followed. Total Employee Involvement and Quality Circle i.e. formal feedback system for improvement of micro process to increase productivity and ergonomics. Management has reviewed the acceptable changes through management review meetings and finalized Kaizen sheet and circulated for its implementation. As on the present period of

time they have developed more than 60 Kaizen work and implemented. In Management review meeting the root cause analysis, why- why analysis and other data analysis are done under aegis of a lean expert.

In Kaizen approach, for one case, the reduction of material loss was the target. Initially the size of base plate was (9 X 8.5) inches and weight was 1.060 gm. After changing the design the reduced size of the base plate becomes (8.5 X 6.5) inches and weight is 820 mg. The target was to reduce the weight. The root cause is to change the design. The result was quantitatively productivity enhancement. Before applying lean tool the weight was 1.060 gm & now weight is 820 mg and thus saving is Rs. 11.50 per plate(Fig 3).

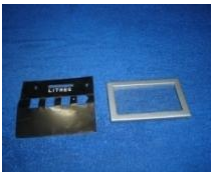
Figure 3

(a) Before

(b) After

The next problem target was to reduce the cost of dial frame material. The existing dial frame was made of aluminum & cost is Rs. 105 per set. Now the material of dial frame is changed and the frame is replaced by rubber bedding. As a result the cost becomes Rs. 35 per set. The benchmark: cost of whole set was Rs.105/-. The target is to reduce it. The analysis done here is why-why analysis solely to investigate why cost is high? Dial frame made of aluminum, why? Not other material, why? Not thinking in line, why? The root cause found was lack of thinking. The result is quantitative productivity improved. The cost was Rs. 105/- per piece & after applying lean concept now cost is Rs. 35/- per piece(Fig. 4).

Figure 4



(a) Before

(b) After

The 3rd theme of kaizen is to de-skill the job by easing some of the process. The kaizen idea is to develop a process for cutting. The problem status is firstly making bacalite sheet by using template and then cutting by knife, breaking by hand and then all edges have been finished by rubbing with emery paper. Counter measures: develop of an attachment of an inter bacalite sheet in required measurement in it and cutting the sheet by cutter which takes earlier the time was 5 minutes time & target is 1 minute. The benefit is in the improvement in productivity. Earlier by applying 5 minutes time required for cutting the cost was Rs. 2/- & now the cost is reduced to Rs. 0.41 paise. (Fig. 5)

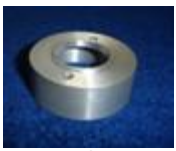
Figure 5

(a) Before

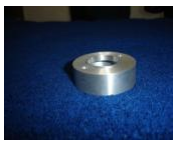
(b) After

The 4th theme is to reduce the size of bush material. Initially, the cost of bush was Rs. 50/- per piece and its output size of diameter was 44 mm. This diameter was found to be excessive while carrying out the why-why analysis. This resulted to think over the existing old drawing. Subsequently, the diameter of the bush was changed in line of Kaizen idea and the reduced diameter was 40 mm. It saved wastages of material equivalent to 4 mm reduction in diameter. Thus, the root cause was lack of thinking (Fig. 6).

Figure 6



(a) Before



(b) After

The 5th theme of kaizen was applied for free maintenance of rotor and shaft. Further, target was set to reduce the length of copper pipe. The kaizen idea was to ease off maintenance hazards of shaft. The analysis under why-why criteria was made to understand the real problem of shaft maintenance. Copper pipes were installed on rotor shaft. The counter measures were now-in-out connection of pump unit has changed and only one copper pipe having length of 6 inches after bending installed on pump unit. The benefit previous servicing problem cost was Rs.158/- and now servicing problem cost is Rs. 97/-(Fig.7).

Figure 7

(a) Before

(b) After

The 6th theme of kaizen focused on to reduce material loss. The problem status : the cap of angular check valve was sand casting. So finishing was not better due to all over machinery requirement. The leakage of inside position was rectified by araldite for leak proofing. The approach based on why category revealed us to know the cause of material loss during sand casting. To overcome all such problems a die for gravity casting was developed. The root cause was sand casting. The previous material requirement was 0.280 gm and cost was Rs 66/- but now material required was 0.180 gm & cost was Rs. 53/- per piece (Fig.8).

Figure 8

(a) Before

(b) After

The 7th theme considered for kaizen was reduction of cost of nozzle. Initially, the tube bend of nozzle was prepared from brass, so cost of it was Rs. 35/-. The why-why analysis was made to understand the reason of higher cost of nozzle, which was made of brass. The root cause was lack of proper thinking; the quantitative benefit was to reduce the cost by using MildSteel at Rs. 27/-. The

counter measures were tube bend of nozzle prepared from Mild Steel (Fig. 9).

Figure 9

(a) Before

(b) After

The details of product wise cost effective Kaizen sheet and the total cost saving per annum is shown in annexure 1.

Conclusion

Small-scale industries in West Bengal are going through a transition phase and are required to restructure their strategies to remain competitive as the government policies are favoring. This can be done through adoption of innovation, technologies, productivity and quality in the manufacturing for competitiveness. Effective use of Lean tool will address to all of the above challenges and make them competitive in the global market.

During 1994 to 2009 West Bengal MSMEs have widely adopted ISO tools for achieving System quality and certain issues like different wastes occurred during processing, Inventory control, better industrial environment, cost reduction remained unattended. Moreover ISO is limited within certain clauses and in some point of time, units find it burdensome to comply with minor formalities surfaced from the inter departments and certification bodies. Comparatively, Lean tools have the open approach to use and unit has the liberty to adopt it as per its priority. On contrary, Lean tools

have limitations such as Selection of right lean consultants, right teams, availability of proper information, proper approach of Govt. Policies and concerned officials as well as awareness of lean programme among West Bengal MSMEs.

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Annexure 1: Product wise cost effective kaizen sheet

Name of the Product	No. of Person doing the Kaizen	Kaizen Area	Cost before Kaizen (Per Pc.)	Cost after Kaizen (Per Pc.)	Cost Saved (Per Pc.)	Production Per Month	Total cost Savings(Rs.)
Nozzle	3 Nos.	Bush for Operating Rod	56.00	30.00	26.00	500 Pcs.	13000/-
-do-	2 Nos.	Bending of Nozzle Tube	5.00	0.50	4.50	500 Pcs.	2,250/-
-do-	3 Nos.	Nozzle Tube Gland	35.00	27.00	8.00	500 Pcs.	4000/-
Angular Check Valve	3 Nos.	Cap of Angular Check Valve	66.00	53.00	13.00	400 Pcs.	5200/-
Meter For Volumetric Measurement	3 Nos.	Base Plate For M.V	55.00	43.50	11.50	10 Pcs.	115/-
-do-	4 Nos.	Dial Plus & Frame	105.00	35.00	70.00	10 Pcs.	700/-
-do-	3 Nos.	Inlet & Outlet Bush	60.00	40.00	20.00	10 Pcs.	200/-
-do-	3 Nos.	Pump Unit Bypass System	158.00	97.00	61.00	10 Pcs.	610/-
-do-	3 Nos.	Lower Drive Gear	350.00	330.00	20.00	10 Pcs.	200/-
-do-	3 Nos.	Register Base	80.00	38.00	42.00	10 Pcs.	420/-
-do-	3 Nos.	Head Canopy	77.00	52.00	25.00	10 Pcs.	250/-
Total Cost saving per Month (Rs.)							26945/-
Total Cost saving per annum (Rs.)							323340/-