

A MODEL FOR IMPLEMENTATION OF LEAN MANUFACTURING IN INDIAN SMALL SCALE INDUSTRIES

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Abstract— *Small Scale industries have a very important role in growing economy of India. In fact after agriculture small scale industries comes second in providing job opportunities to the people of India. But being such an important tool small scale industries has never been a topic of concern or to develop a model of Lean Manufacturing Implementation process in small and scale industries very less research has been carried out for the betterment of them. The objective of this research is. Small scale industries defines the industries between 5-10, crores of investment and with 20-30,40 employees or the industries where the involvement of an engineer is very less. Most of the operations are carried out by foreman or chief technician. As a result a cheap and easy to understand model has been developed suitable for small scale industries.*

Key Terms— *Lean Manufacturing, Model, India, Small scale industries.*

I. INTRODUCTION

The basic idea of Lean is to manufacture without waste. Waste (“muda” in Japanese) is of seven types: waste from overproduction, waste of waiting time, waste of transportation, waste in inventory, processing waste, waste of motion, and waste from defective products [1]. Lean Manufacturing is the processes, strategies and initiatives being adopted by companies around the world that mainly aim’s in reduction of non-value added activity of the company [2]. In other words, Lean Manufacturing refers to an integrated social-technical system whose main aim is to eliminate waste [3]. Lean Manufacturing is the practice of eliminating waste in every aspect of production right from customer relations (sales, delivery, billing, service and product satisfaction) to product design, supplier networks, production flow, maintenance, engineering, quality assurance and factory management. Lean can also be defined as internal tools for creating a streamlined, high quality system mainly

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aimed at producing finished products at the pace of customer demand with little or no waste at all [4]. The efficient use of and economical manner possible.

Essentially, the core idea of lean manufacturing is to maximize customer value while minimizing waste. The ultimate goal of implementing lean production in an operation is to increase productivity, enhance quality, shorten lead times, and reduce cost and so on [7].

Lean Manufacturing is a manufacturing strategy aimed at achieving the shortest possible cycle time by eliminating waste. Lean Manufacturing is a comprehensive term referring to manufacturing methodologies based on maximizing value and minimizing waste in the manufacturing process.

Resources through the minimization of waste are the essential aspect of leanness as the aim of lean manufacturing is to reduce waste and non-value added activities [5]. The main objective of lean is to utilize less human effort, less inventory, less time to respond to customer demand,[6] less time to develop products and less space to produce top quality products in the most efficient and economical manner possible.

II. LEAN MANUFACTURING IN SMALL SCALE INDUSTRIES

It is a well-known fact that small scale as an integral part of Indian economy .Since small scale industries lack sufficient resources as compared to large scale industries implementing lean manufacturing has still come as an option for small scale industries to improve productivity. Implementation of lean manufacturing has been quite successful in large scale industries but there is still less evidence of its implementation in smaller organization. The increasing demand for high quality products and highly sophisticated business processes by large organization has left no choice on the small scale industries to consider Lean Manufacturing. The main purpose of this study is to find out the fundamental method which is relevant to all kind small scale industries. In past few years so called Small scale Industries moved into the focus of many authors in their scientific work. The reason for this trend is based on the fact, that micro, small, and medium-sized enterprises are numerous and usually the backbone of the economy [8].

Small scale industries as compared to large scale industries have various like finance and budget , lack of skilled manpower , the life of the industry , the management is sometimes not ready to implement a new method of operation even they are aware of it as they fear of failing. Besides, in such industry the decisions are always made for short duration rather than going for a long run.

Besides these weaknesses small scale industries have various advantages over large scale industries like:

- Flexible , hence quick and easier to introduce new method
- Few layers of management and fewer departmental interfaces
- Smooth execution and implementation of decisions
- Culture of change and learning rather than control
- More responsive to market needs and customer's demand [9]

Due to their flexibility and smooth execution, the entrepreneurial spirit and the innovation capabilities of Small scale Industries proved to be more robust than large industries, as the actual financial and economic crisis turns up [10].

A. Model Development

It is always a mammoth task to implement a new manufacturing method in Indian small scale Industries as the employee are very less qualified or trained, so they hesitate to adopt a new method .In this study a cheap and easy to understand model for implementing lean manufacturing in Small scale Industries in India has been developed. At first the model is divided into 5 phases. These 5 steps will lead the industry to develop a lean model for them.

The process of implementing Lean Manufacturing comprises of 5 steps:

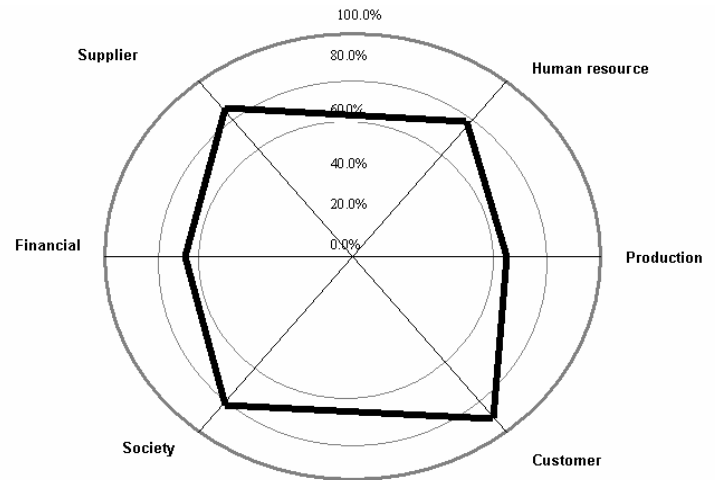
1. Assess the current state
2. Identify the problem(s) and analyze
3. Select the preferred alternative(s)
4. Implement the decision
5. Monitor & Control the process

1. Assess the current state

The first phase is assessing the customers. Who are the Customers and what are their desire from the company is the assessment the company has to do. Since using software and using lean measures like Balance score card are not the options the industries are looking for. Assessment using lean profile chart could be best suited for these industries.

a. Identify customers: this is the first stage. Different subsets of customers are likely to have different types of taste and need .Information from different factors should be gathered on the basis of economic factors product service and product quality factor.

b. Lean profile chart: Lean profile chart is used to display the current statues of the Performance and the gap between it and their specific lean targets. A set of questionnaire is distributed among the different areas of the industry like customers, suppliers, employee, finance, human resource, production and society.



Lean profile of the six key areas [14]

2. Identify the problem(s) and analyze

Lean profile chart gives the clear picture of the problems in the industry. With the help of the profile company have now found out what is the problem in the industry, now the industry can go for improvement. There are several improvement tools available to analyze the problems, i.e. cause and effect diagram, flow diagram, histogram, Pareto chart, scatter diagram, control charts, and trend chart but since the industries taken into account in this study are small scale and it is very less chance that these industries would go for above mentioned tools so analytical study is suggested here. By knowing the problem management can analyze the criticality of the problem and generate improvement suggestions based on the problem itself by starting with the most critical one.

3. Select the preferred alternative(s)

The industry can use a set of evaluation criteria to consideration when evaluating different suggestions. To evaluate the alternatives, a set of criteria is suggested.

1. Present Worth of the industry
2. Non Value Added ratio for side product
3. Lead time of side product
5. Standard work procedure

As the industry goes through these criteria evaluation process. Now the industry has to select the lean tool for them. The lean tools suggested to the industries are:

1.5S

Often Poor workplace conditions leads to rise of wastes such as time spent in searching for he needed items or motion to avoid obstacles. Sometimes the situation may be fatal. Solution can be started by establishing good workplace. 5S is lean manufacturing tool for work place organization and it is fundamental to the implementation of lean strategies. 5S is a reference to five Japanese works which described standardized clean up [11].

5S consists of the Japanese words Seiri (sort), Seiton (set in order), Seiso (sweep and clean), Seiketsu (standardize),

Shitsuke (sustain). The underlying concept of **5S** is to look for waste and eliminate it. Waste can be in the form of scrap, defects, excess raw materials, unneeded items, old broken tools, and obsolete jigs and fixtures. 5S could be the easiest and the most important tool for small scale industries to adapt as it does not demands much financial and other resources.

2. KANBAN

KANBAN means ‘signboard’ (kan □ visual and ban □ card). It is a Japanese word which is used to create visual indicators for the operators so that they can determine for how much time they have to perform the operation and when to stop. It’s also includes the others prospects like what to do and whom to contact if any problem occurs. To ensure the Implementation of Kanban system a success, certain factors should be considered such as inventory management, vendor and supplier participation, quality improvements and quality control and employee and top management commitment [12]. Operators produce goods based on their actual usage, rather than forecasted usage. Kanban is not actually a planning tool; it is a method which is used to implement a process for producing goods efficiently.

Benefits of kanban

- Kanban reduces inventory by encouraging the operator to examine the parts responsible for inventory build-up.
- Using kanban we can reduce the unnecessary movements of raw materials directing towards proper utilization of space.
- Prevents overproduction: overproduction is the most severe waste in terms of lean manufacturing. Overproduction always results in heavy losses to the organization. As it enhances the inventory level but kanban scheduling controls the over production by specifying the product lot size.
- Kanban allows operator to see whole schedule at a glance. It gives a clear picture to the operator to decide: What to run? How much to run? What sequence to run? Hence, it takes out the guess work as everything well defined for the workers.

Using kanban we can immediately make changes in our product as per the customer demand by using visual indicators. Hence throughput time decreases and responsiveness of the industry increases.

3. Total Productive Maintenance

Total productive maintenance (TPM) is chosen as one of the suggestions to maximize the Overall Equipment Effectiveness by reducing equipment downtime while improving quality and capacity. The main aim of TPM is to predict failures and fix them before they cause any failure in machine and downtime. The basic steps to implement TPM are:

- a. Top management’s decides to introduce TPM.
- b. Organize an educational campaign to introduce TPM
- c. Establish basic TPM policies.
- d. Formulate a plan for the development of TPM

- e. Start to implement the plan for TPM.
- f. Improve effectiveness of each piece of equipment.
- g. Develop a scheduled maintenance program for the maintenance department.
- h. Conduct training to improve operation and maintenance skills.
- i. continuous follow ups

4. Single Minute exchange of Die

Aiming to reduce waste, there are several methods and strategies that companies can adopt depending on the desired results. One of the most popular methods is Single Minute Exchange of Die or SMED [13]. SMED is one of the many lean production tools for reducing waste in a manufacturing process. It provides a rapid and efficient way of converting a manufacturing process from running the current product to running the next product. This rapid changeover is the key to reducing production lot sizes and thereby improving the flow which is the lean aim. Performing faster change overs is important in manufacturing or any process, because they make low cost flexible operations possible. The phrase “single minute” does not mean all the changeovers should be made within a minute but then they should take less than 10 minutes. (In other words “single digit minute”).

Apart from these an industry can introduce other tools like **OEE, Kaizen, Poka-yoke, lean six sigma, six big losses** as per the feasibility and demand of the production line.

4. Implement the decision

Now the preferred alternative is implemented. It is a great challenge for small industries to implement to implement lean manufacturing in their industry. They must go through certain barriers like employee not ready to learn new process, if ready training them again is a problem. To overcome this kind of problem the company can hire lean consultants or give them basic training, workshop as per the feasibility of the company.

5. Monitor & Control the process

After implement, the goal of monitor and control is to make sure that the improvement is Going as planned, and any gains made from the improvement will be preserved, until and Unless new technology and data show that there is a better way to operate the process.

CONCLUSION

To stay alive in global competition the authors believe Lean Manufacturing is the best management tool. Various studies have shown that lean manufacturing shows higher level of quality and productivity are ensured by Lean manufacturing. To implement Lean manufacturing for a large scale industry is not a difficult task but for a small scale industry it is always a challenge as they have limited resource. The model developed in this study is a cheap and easy to adapt .An industry can hire a lean consultant to train their employees and enjoy the prolificacy of lean manufacturing.

As a conclusion the authors noticed that this is a simple model and there is still gap in lean model and Practices which requires further research.

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P. M. Rojasra, M. N. Qureshi *International Journal of Modern Engineering Research (IJMER)* Vol. 3, Issue. 3, May - June 2013 pp-1654-1660