



# Awareness of Lean manufacturing in plastic pipe industries- a survey

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**Abstract:** With the global trade agreements and global competitions among the manufacturers many sectors of manufacturing industries particularly, small scale companies have virtually collapsed. In view of the fact that Lean Manufacturing (LM) thinking enables manufacturers to lower the cost of production by transforming time spent on 'non-value adding' activities into 'value adding' activities. This paper presents the level of awareness about the lean manufacturing within the plastic pipe manufacturing industries. A field survey with a structured questionnaire, interviews and site visits were conducted to get necessary information from the respondents.

**Keywords:** Lean manufacturing, implementation, awareness, survey, tools.

## I. INTRODUCTION

Lean Manufacturing is a systematic approach for identifying and eliminating waste in operations through continuous improvement for doing everything more efficiently, reducing the cost of operating system and fulfilling the customer desire for maximum value at the lowest price. It may be defined as 'lean manufacturing is the identification and application of best manufacturing practice to eliminate waste and variation' [1].

Within a lean manufacturing production system such as the 'Toyota production System' (TPS) there is a base operating methodology, utilized by manufacturers in Japan under the heading of Genba Kanri [2]. These basic operating rules have been developed over many years in several Japanese companies to the point where they are now implicit in manufacturing operations.

'Toyota Production System' which was relabeled as 'Lean manufacturing' by Womack, Jones, and Roos [3] in their book "The Machine that Changed the World" has influenced the manufacturing practices around the world. The fundamental of TPS is to eliminate wastes and produce only the items needed at the required time and in the required quantities. Principles of lean are universal as they are broadly accepted by many manufacturing operations and have been applied successfully across many disciplines [4]. It has become an integrated system composed of highly inter-related elements and a wide variety of management practices, including Just-in-time, Quality System, Work Teams, Cellular Manufacturing, etc. [5]. The main purpose of implementing lean manufacturing is to increase productivity, reduce lead time and cost, and improve quality, thus providing the utmost value to customers [5].

There are many descriptions regarding lean manufacturing. It is most frequently associated with the elimination of the seven important wastes called *asmuda* in Japanese. The original seven wastes (*muda*) are Overproduction, (Production ahead of demand), Waiting (Waiting for the next production step), Unnecessary transport, Over processing or incorrect processing, Excess inventory, Unnecessary movement or motion, and Defects and rework [6].

According to Womack Jones, and Roos, [3] lean manufacturing uses less of everything compared to mass production- half the human effort in the factory, half the manufacturing space, half the investment in tools and half the engineering hours to develop a new product. In addition, it requires keeping far less than half of the needed inventory on site, results in many fewer defects, and produces a greater and ever-growing variety of products. In short, it is called lean because it uses less, or the minimum, of everything required to produce a product or perform a service [7]. Considering the importance of Lean Manufacturing for improving the productivity of an industry, it has been decided to identify the awareness about this method among the plastic pipe industry.

## II. METHODOLOGY

To study the awareness of lean manufacturing in plastic pipe industries, a structured questionnaire has been developed as a primary data collection tool. Questionnaire includes awareness about lean manufacturing, kind of waste, lean manufacturing tools, its requirement in functional areas, status of implementation, preparation /mode of implementation, expected benefits and barriers in implementation. Small, Medium and large scale plastic pipe industries of Vidarbha region of Maharashtra have been considered for the survey. A sample size of 50 was selected. 84% industries have responded. The data has been analysed and presented below

### III. DATA ANALYSIS

#### 3.1 Awareness about Lean Manufacturing

Lean manufacturing play an important role in the improvement of productivity of any industry. Maximum plastic industries in the Vidarbha region are small and medium scale. The Fig.1, shows the awareness about the lean in percentage.

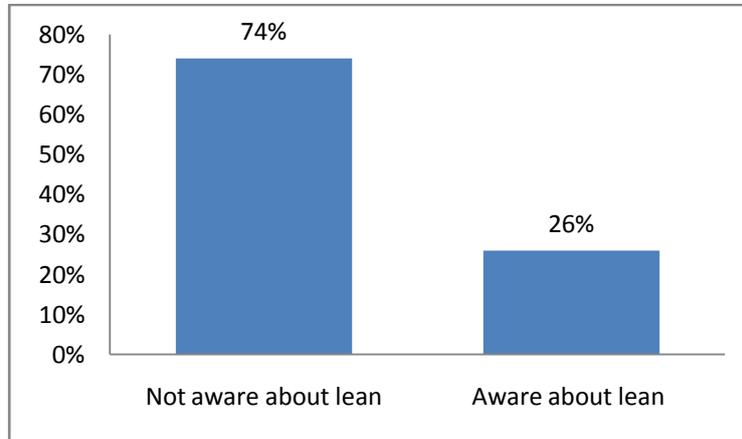


Fig. 1: Awareness about lean manufacturing

From the above fig. 1, it is observed that maximum 74% industries are not aware about the concept of lean manufacturing.

#### 3.2 Different Kind of Waste

According to the lean manufacturing concept there are seven types of wastes commonly known as seven deadly wastes. They are: Overproduction, Rework, Inventory, Transport, Over Processing, and Movement. Fig. 2, shows the percentage of different kind of waste present in the industries

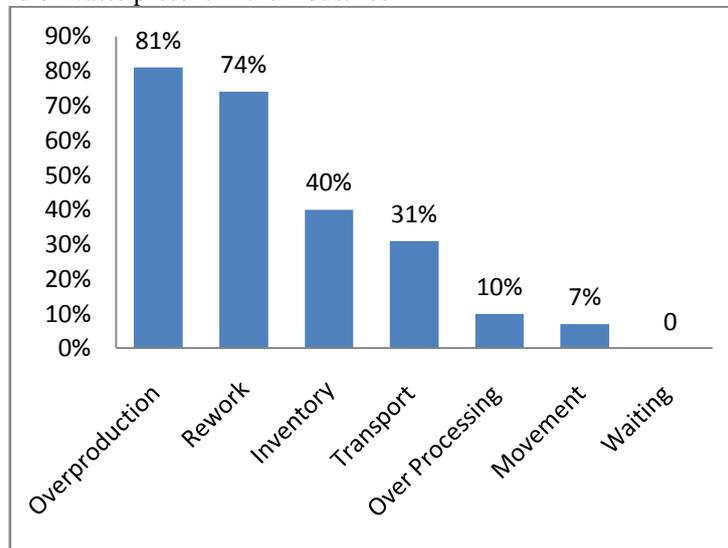


Fig. 2: Different kind of waste in plastic pipe industries

From the Fig. 2, it is observed that overproduction, and reworks are the major waste in these industries. As the majority of the industries are working on the seasonal basis, they have to do overproduction to fulfill the demand in season hence it is difficult to eliminate the overproduction waste in such industries. The defects or rework types of waste can be eliminated by the lean manufacturing.

#### 3.3 Lean Manufacturing Tools

In Lean manufacturing, different types of tools are used for the elimination of waste. The tools considered here includes: 5S, Total Productive Maintenance (TPM), Just in Time (JIT), Value stream Mapping (VSM), Root cause Analysis (RCA), Single Minute exchange of Die (SMED), Standardized Work, and Poka-Yoke techniques. Fig. 3, shows the awareness about the different tools of Lean Manufacturing in percentage

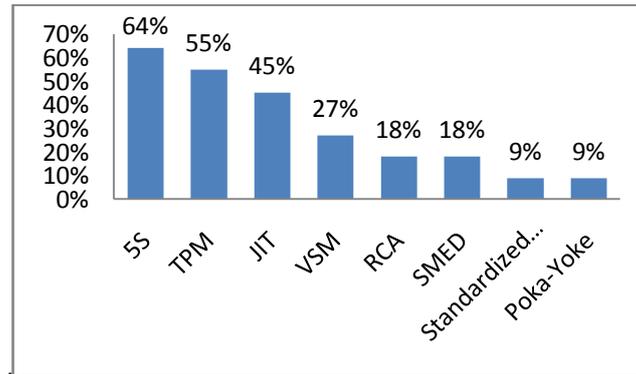


Fig. 3: Awareness about Lean Tools

From the fig. 3, it is observed that majority of the industries are known about 5S, TPM and JIT only. Very few industries are about the remaining lean tools.

### 3.4 Need of Lean Manufacturing in Functional Areas

Researchers' suggested that lean can be implemented in all the functional areas (departments) of an organization because waste can be present in any department. The maximum plastic pipe industries in Vidarbha region are small scale and they don't have the special department like human resource, planning, research and development etc, but in medium and large scale industries such a special departments are available. The fig.4 shows in terms of percentage the requirement of lean in various areas of organization.

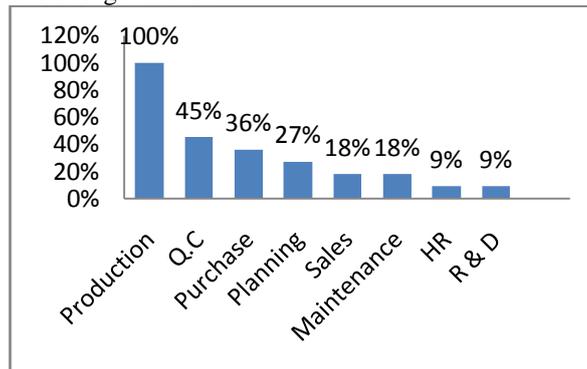


Fig. 4. % requirement of lean in functional areas

From the fig.4, it observed that "Production department" has been given first preference followed by Quality control and purchase department.

### 3.5 Implementation of Lean Manufacturing

Out of 45 industries in the sample, 11 industries are aware about the Lean manufacturing. Eight industries out of eleven are interested to implement the concept of lean manufacturing. Fig.5 shows the percentage of the industries interested / planning to implement lean manufacturing in their plant.

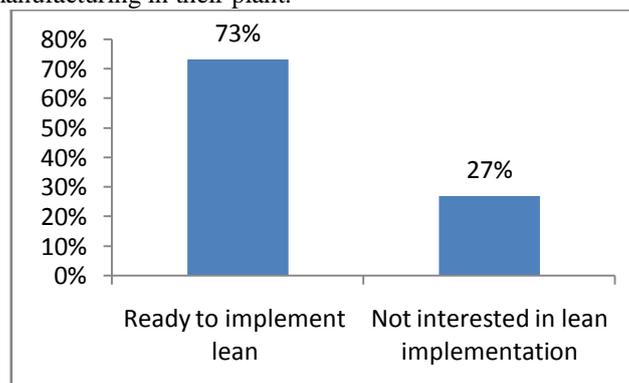


Fig. 5 Preparedness for lean implementation

From the above figure it is observed that 73% of the industries are interested or planning to implement lean manufacturing in their plant.

### 3.6 Approaches for lean implementation

For implementation of the lean manufacturing, different approaches are being used by industries based on their status and financial conditions. The fig. 6 shows the information regarding the qualified staff required by various industries in terms of percentage.

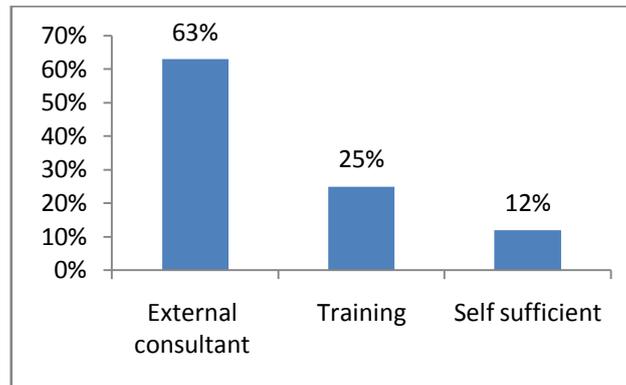


Fig. 6 Qualified staff required for lean implementation.

From the fig.6, it is observed that 63% industries need external agencies or consultants for the implementation of lean in their plant, 25% industries need training and 12% of the industries are self sufficient about the qualified staff regarding the implementation of lean and they can implement lean at their own.

### 3.7 Benefits of lean manufacturing

Researchers have described numbers of advantages of implementing lean manufacturing in industry. The benefit includes: higher productivity, lower cost, higher quality, shorter lead times, flexibility, better delivery performance, shorter development time. The fig. shows the ranking(in%) of benefits of Lean manufacturing in plastic pipe industries.

From the fig. 7, it is observed that higher productivity, lower cost and improvement in quality have been considered as most important benefits of implementation of lean manufacturing in the plastic industries

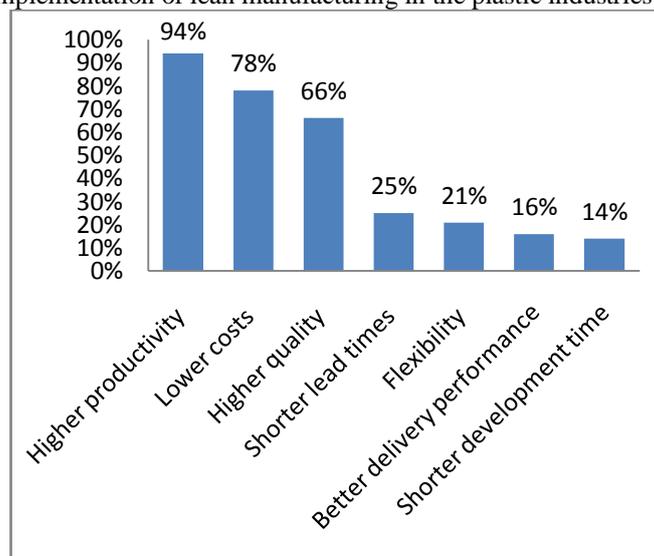


Fig. 7: Benefits of Lean manufacturing

### 3.8 Barriers in Lean implementation

There are several obstacles in implementation of lean in industry. The common obstacles are as follows: lack of awareness, lack of faith, shortage of trained staff, employees' resistance, lack of awareness about financial benefits, unwillingness of management, financial constraints, time constraints, company culture, failure of past project etc. The fig. 8 shows the rank of barriers in implementation of lean manufacturing in plastic pipe industries.

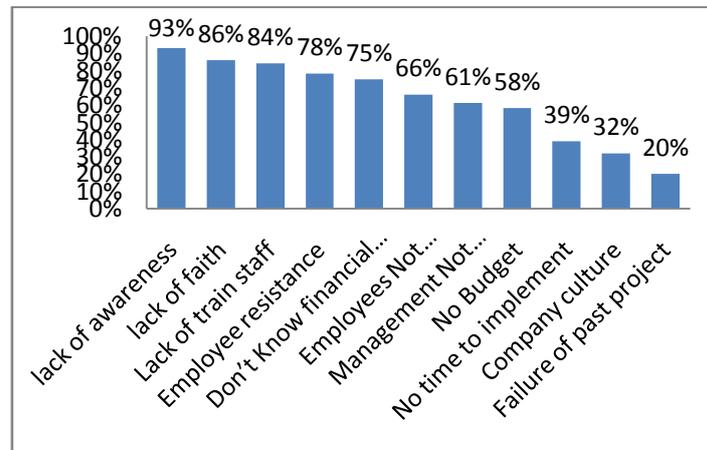


Fig. 8 Barriers in Lean implementation

From the study, it is observed that the major five roadblocks in implementation of lean manufacturing are lack of awareness, lack of faith, shortage of trained staff, employees' resistance, and lack of awareness about financial benefits.

### CONCLUSIONS

The result of this study reveals that the plastic pipe industries in Vidarbha region of Maharashtra follow traditional manufacturing process. Maximum industries in this region (up 74%) are unaware about the lean manufacturing concept. Very few industries (those are particularly large scale) are aware about the lean manufacturing and different lean manufacturing tools. It is also observed that over production and defects/rework are the major wastes in these industries. The main benefits from the lean implementation observed are, higher productivity, lower cost and improvement in quality. The major barriers in implementation of lean in the plastic pipe industries of this region are lack of awareness, lack of faith, shortage of trained staff, employees' resistance, and lack of awareness about financial benefits.

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### BIOGRAPHIES



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