

STUDIES ON WASTE ELIMINATION STRATEGIES IN INDIAN AUTOMOTIVE FIRMS USING TAKT TIME APPROACH

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Abstract Lean manufacturing is a performance-based strategy for maximizing customer value by elimination of waste, while improving profitable growth of the organization. It is viewed as a roadblock to customer satisfaction and a company's profitable growth. There is an immense need for the manufacturing organizations to remain competitive and produce high quality outputs not only at a national level but also at global level. Thus, numerous companies have a major opportunity to reduce their costs and customer lead time and cycle time through the application of Lean Manufacturing techniques. The present study has been performed at Recliner Assembly Shop of an automobile manufacturing industry in North India with an aim to develop and implement Lean Manufacturing Program. The systematic procedure has been adopted to identify wastes, their reasons of occurrence and selection of suitable methods adopted for their removal. The brainstorming sessions has been conducted to chalk out causes and effects of different types of wastes. The expert's views have been collected to adopt the appropriate action leading to minimum cost, minimum effect on other areas and maximum ease to eliminate the wastes. This study offers proven solutions for implementing lean manufacturing in an enterprise environment, covering the engineering and production aspects as well as the business culture concerns. It acts as a manual providing the progressive steps to factory transformation to lean manufacturing.

KEYWORDS: lean manufacturing, takt time, Recliner

INTRODUCTION

Lean manufacturing derives its name from the manufacturing systems and processes of the Toyota Production System that are so effective at low cost, and short cycle times. These systems are highly flexible and responsive to customer requirements. Lean manufacturing means eliminating wastes by identifying non value added activities throughout the supply chain. (Rameez & Inamdar, 2010). The aim of lean manufacturing is the elimination of waste in

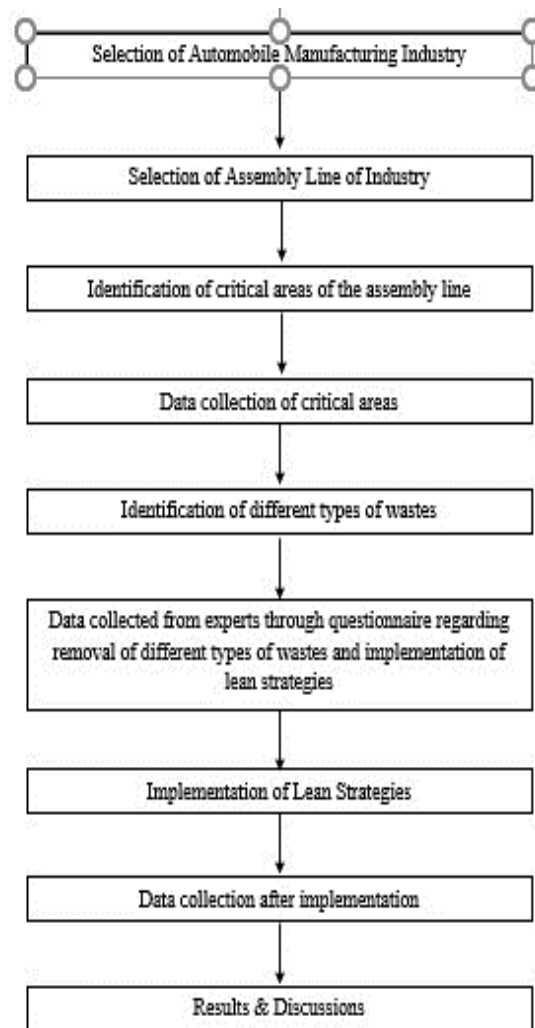
every area of production including customer relation, product design, and supplier network. Its goal is to incorporate less human efforts, less inventory, less time to develop products, and less space to become highly responsive to the customer demand while producing top quality products in most efficient and economical manner possible. Lean manufacturing is a proven technique that allows work to be performed without bottlenecks or delays. In the lean environment, these activities do not add value to the product and considered a waste. The lean manufacturing methodologies eliminate the wasteful activities by linking and balancing equal amounts of work steps together enabling products to be consume directly into the next step, one piece at a time until completed (BillRay, 2006) [1].

LITERATURE REVIEW

Veinazindiene and Ciarniene (2013) studied that by applying Lean tools the substantial progress is seen in areas as return on assets (100%), on time delivery (99%), machine availability (95%), and inventory reduction (75%) [2]. Sullivan et al. (2002) (Toyota Production System) The purpose of this paper is twofold to provide a roadmap to illustrate how value stream mapping (VSM) can be design a desired future. The tangible gains they achieved inventory savings, reduction in shop floor area and higher quality. The intangible benefits achieved greater flexibility, shorter lead times [3]. Mohanty et al. (2006) they studied the seven pillars of lean manufacturing practices to eliminates waste in any form in industry [4]. Abdulmaek and Rajgopal (2006) focused on cost reduction by eliminating non-value added activities by Value Stream Mapping. The ultimate goal of VSM is to identify all types of waste in the value stream and to take steps to try and eliminate these [5]. Gurumurathy and Kodali (2010) studied the principles and concepts of "lean manufacturing" with the objective of achieving superior competitive advantage over the organizations. The results obtained are the distance a part travelled from raw material to finished products. The total distance reduces from 62 meters to 54 meters [6]. Ramnath et al. (2010) concluded

the results by applying value stream mapping lean tool. The elimination and reducing of wastes is by making the process improvements in the current manufacturing line by adopting some lean tools like JIT, set up time reduction. They reduced the number of operators from 9 operators to 5 operators. Productivity per operator is increased from 222 per operator to 400 per operator [7]. Rameez and Inamdar (2010) studied about the Lean Manufacturing Tools. By applying lean tools, the production of the pump set has increased from 3200 to 8000. The distance travelled is less as compared to the old assembly line [8]. Rajenthirakumar and Thyla (2011) concluded that lean manufacturing is a philosophy for structuring, operating, controlling, managing, and continuously improving industrial production systems. By reducing the wastes 32% productivity is increased. Cost of power 9.6 lakhs per annum is saved [9]. Parkash et al. (2011) defined that lean manufacturing is a systematic approach to identify and they achieved the results by applying this technique. They reduced the new product development time from 3 to 4 years to 1 year. Effects per machine reduced from 8.0 to 0.8. Product delivery lead time reduced from 4 to 20 weeks to 1 to 4 weeks [10]. Kumar and Abuthakeer (2012) explained about the SMED (Single Minute Exchange of Die). SMED is a scientific approach to set time reduction. The ultimate goal of SMED is to perform machine set up and changeover operations in less than ten minutes. By implementing the SMED techniques, the total time taken to perform set up time taken to perform setup activities at press was reduced by from 40 minutes to 12 minutes [11]. Mehta et al. (2012) studied the Lean Tool Kaizen. The term lean denotes a system that utilizes less input, to create the same the maximum output. By implementing Kaizen avoided the problem of wastage of broaching oil during reloading the component in trolley after broaching. Trough Kaizen the company improve their work, workplace resulting in productivity improvement [12]. Jasti and Sharma (2013) studied the Value Stream Mapping tool. The study of VSM brings out the positive impact on process ratio, TAKT time, process inventory level, line speed, total lead and process time and reduced man power. It is helping the company in satisfying their customers with respect to quality, cost and delivery. They reduced the Total process time (min) 147.94 to 142.18. Reduction in number of operations from 15 to 14 [13].

RESEARCH METHODOLOGY



RESEARCH OBJECTIVES

The following are the research objectives of this study:

- To identify the critical areas and different types of wastes on assembly line.
- To implement the lean strategies for minimizing the different types of wastes in assembly line.
- To assess the impact of implementation of lean strategies on the assembly line.

DEVELOPMENT OF STRATEGY FOR IMPLEMENTATION

The steps employed in the qualitative modelling have been as under:

- a) Identification of experts.

- b) Dissemination of results of analysis to experts.
- c) Generalized of the provision/controls identified under each of the above area, by experts.
- d) Identification of factors and parameters influencing development of a generalized approach by brainstorming and idea generation.
- e) Collection of qualitative score to a quantitative score using the scoring scale and the number of responses to a choice.
- f) Listing the results of various generalized provision/controls in reducing order of their cumulative scores, separately for lean wastes.
- g) Using expert's opinion of these provisions and deciding an order of priority to the four major areas studied.
- h) Formulation of phased implementation approach by picking up the provisions which had higher weighted scores in the lean wastes.

RESULTS & DISCUSSION

There are two types of controls are implemented in the industry. These are:

1. Engineering controls are generally preferred because they eliminate or reduce employee's exposure to potentially hazardous conditions. These controls included changing the workstation include all the characteristics like layout, tool design, or changing the way the materials, parts and products are transported to reduce setup & cycle time.
2. Administrative controls include work practices, policies, training program sand providing instructions in work practices that can ease the task demands or burden.

Concurrent improvements to work practices ensure that employees understand the benefit of the changes and promote proper use of the equipment. Work practices modifications are including proper use of work procedures and training operators to allow them to understand the proper techniques to use while performing tasks.

ROOT CAUSE ANALYSIS OF WASTES

A Cause and Effect Diagram has been developed to examine the factors that are contributing to the wastage. The Cause and Effect Diagram was developed through four steps, namely:1) Identify the problem's characteristics 2) Brain storming the reasons why the problem is occurring using a casual table (also known as the Why- Why Analysis) 3)

Group the causes by relationship 4) Create a Cause and Effect Diagram.

The causes are grouped as Man, Machine, Material and Method. The diagram makes it easy to see the many possible root causes of the issues that may be leading to wastes:

CONCLUSIONS

From the results and discussion, the following conclusions are drawn:

1. Lean Manufacturing Tools have been successfully implemented in Automobile industry with total average inventory reduction to Rs.411 lacs as compared to Rs.475 lacs initially.
2. Line balanced by doing TAKT time study by clubbing the operations with the existing operations & line productivity is increased.
3. Lean manufacturing implementation has been shown to reduce the setup time by 29 %.
4. The breakdown is reduced by 4% and the absenteeism is reduced by 15%.
5. The cost of one-man power has been saved by Rs. 96000 annually.

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BIOGRAPHY



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