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Applying lean in aerospace manufacturing

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Abstract

Lean manufacturing provides a new management approach for many small and medium size manufactures, especially old firms organised and managed by under traditional push systems. Improvement results can be dramatic in terms of quality, cycle times, and customer responsiveness which is more than a set of tools and techniques and has been widely adopted by many production companies. In Lean manufacturing all employees continuously look for ways to improve processes. Simply lean, is a systematic method for eliminating waste within a production process. It also takes considers waste created through overburden and also through unevenness in workloads. The main concept is to increase customer value with minimum waste. Lean is simply adding more value for customers with fewer resources. The advantage of this concept is, it reduces non-value-added resources, including space, material, tooling, and labour. It applies such principles as waste minimization, flexibility, and responsiveness to change; these are supported by efforts to optimize the flow of material and information and to achieve superior quality in order to eliminate scrap and rework. Though lean manufacturing was originally developed for the automotive industry, aerospace manufacturing companies have found that these principles can also be applied in this high-precision industry to create dramatic improvements in the efficiency of production. Our aim is to identify the bottlenecks in the production line of a reputed manufacturing industry. The main objective is to provide a background on lean manufacturing, present on overview of manufacturing wastes and introduce the tools and techniques that are used to transform a company into a high performing lean enterprise.

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1. Introduction

Lean manufacturing, a methodology which is used to reduce the waste in production process, from view of customer who consumes a product, “value” is any action that customer would be willing to pay for. So for a lean organization the ultimate goal is to provide perfect value to the customer through perfect value creation process that has zero waste. Lean manufacturing is based on rationale of removing activities that don't add value to the production systems especially those associated with elapsed time, methods, processes, places, people and movements. It has been noticed that lean manufacturing has been implemented successfully in large organizations but there are very less documented evidences of its implementation in small and medium sized enterprises(SME), in order to withstand competition in this business world with increasing demand for high quality products lean implementation is essential. Past literature showed most of practitioners had highlighted lean manufacturing could reduce inventories, lead time, rapid developments and strong processes. The work had started with the selection of a reputed SME, all the production processes are studied and represented in form of flowcharts by which connection between the processes in production can be known, there after process can be studied clearly and bottlenecks can be identified and also trying to study their impacts on other processes. In this work we are proposing some sort of suggestions, improvements and developments in the production processes before and after the implementation of lean techniques which are further explained in results and discussions.

2. Literature review.

Last two decades had witnessed explosion of researches into the area of manufacturing improvement such as lean manufacturing, TQM and their application within various manufacturing companies such as automotives, electronics, plastics components etc. It was proven that lean manufacturing was considered as the best manufacturing system in the 21st century [1]. In the present business scenario, competitiveness of manufacturing companies is determined by their ability to meet and respond as swiftly as possible to the changing environment scenario and to produce and supply high-quality products at lower cost as per demand of the customer [2]. Better, Faster, Cheaper emerged in the 1990s as a new paradigm for aerospace products. The concepts of value and best lifecycle value are introduced as conceptual frameworks. Value is offered as a metric for BFC. Risk management is intimately tied to achieving value and needs to be integrated into aeronautical processes [3]. Lewis argues that Lean can help organisations within any sectors to achieve significant performance improvement. The improvement can be in many dimensions including quality, productivity, cost efficiencies, and profitability and customer satisfaction [4]. All Original Equipment Manufacturers organizations in Aerospace, Automotive and Electronics industries had to upgrade their functions. These organizations including suppliers and solutions providers are duty bound to improve their functions through strategic initiatives, one such initiative is Lean Process Management [5]. The findings show that most of the respondent firms are classified as in-transition towards lean manufacturing practice. These in-transition firms have moderate mean values for each of the five lean manufacturing practice categories [6]. The implementation of lean and sustainable manufacturing was aided by the use of discrete event simulation and optimization to overcome deficits in lean's traditional implementation strategies [7]. Today, principles and practices of Lean manufacturing are widely used by industries to eliminate waste and make the process more efficient. Lean has been recognized as one of the key approaches in enhancing the productivity and hence the competitiveness of an organization [8]. The focus of the approach is on cost reduction by eliminating non value added activities. Applications have spanned many sectors including automotive, electronics, white goods, and consumer products manufacturing [9]. These plants are typically characterized by substantial capital investment, mass production and a repetitive manufacturing environment [10]. Aerospace industry is a value-added and technology integrated industry. The aerospace manufacturing suppliers have to coordinate the demand of quality, delivery, cost and flexibility of aircraft to achieve customer satisfaction [11]. Typically the types of waste considered in a lean manufacturing system are Overproduction, Waiting, Inventory or Work in Process, Processing waste, Transportation, Motion and Making defective products [12]. A Lean Management approach was pursued through the re-engineering of the production flow and the implementation of a pull-based system [13]. It's also a culture in which all employees continuously look for ways to improve processes by LM tools like kaizen, Kanban, poka yoke which can reduce the waste in production line [14]. Some key areas are developed to evaluate and reduce the most optimal projects so as to enhance their production efficiency and increase the purpose of the economic benefits of the manufacturing unit [15]. Clear understanding of relationship among these variables will help organizations to prioritize and manage

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