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A Brief Literature Review of Lean Manufacturing

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Abstract

Minimizing wastage of resources and moving towards implementation of lean manufacturing has become an essential strategy for success. Lean manufacturing is a concept to reduce the waste which is in the manufacturing system. In the concept of lean manufacturing, excess inventory, waiting of equipment and man power, unnecessary transportation of equipment and materials etc are considered as waste. It means that waste is not limited to time and materials in the lean manufacturing concept. This paper is regarding the brief literature review of lean manufacturing.

Key words: Lean manufacturing, waste, waiting, inventory

1.Introduction

Minimizing wastage of resources and moving towards the implementation of lean and green manufacturing has become an essential strategy for success. Most of the lean concepts have been derived from the Toyota Production System (TPS). The aim of lean manufacturing is to reduce waste in terms of human effort, inventory, waiting, etc. from the systems and operations while increasing productivity by extracting as much outputs as they can obtain from lesser inputs (Liker, 2004). Lean manufacturing is defined as "the system which aims at the elimination of wastes from manufacturing processes with a systematic and continuous approach" (Ohno, 1988). Waste is anything other than the essential resources of equipment, effort, machines, materials, parts, space, time and workers that are

vital to add value to the product (Russell and Taylor, 1999). The seven categories of waste identified from the TPS include overproduction, waiting for equipment and human resources, transportation, over-processing, inventory, motion and defects (Hines and Rich, 1997). According to Monden (1998), any process inside a manufacturing facility can be classified into any one of the three categories as an incidental activity, value-added activity or non-value-added activity, i.e., waste (muda). Incidental activities are the processes, such as inspection, that do not add value to the product but are required in the current production system. Value-added activities are the processes, such as the final assembly of a product, that increase value of the product. Non-value added activities are the processes that do not add any value to the product. The key thrust

of the lean concept is to increase value-added work by eliminating wastes and reducing incidental activities. Most concepts of lean involve a pull scenario; this is opposite to the 'traditional' push scenario.

2.Literature Review

The origin of the lean style of production is visible in the works of Henry Ford, such as '*My Life and Work'*, '*Today and Tomorrow' etc.* which outlined the revolution in Ford Production System (Ford, 1922; Ford, 1926). Ford had developed many techniques associated with today's modern lean manufacturing such as single-piece-material-flow and continuous improvement. Further development in lean manufacturing has then evolved from Taiichi Ohno's experiments and initiatives over three decades at Toyota Motor Company. In fact, the world's best manufacturing companies like GM, Ford and Chrysler have independently created major initiatives to develop Toyota-like production system (Spear and Bowen, 1999). Sugimori et al. (1977) published the first academic article on lean manufacturing, followed by the appearance of narrowly focussed articles on topics such as 'just-in-time' and 'pull production system' (Monden, 1981a) and on production and leveling production (Monden, 1981b). Krafcik (1986) presents IMVP's first assembly plant benchmark results in his paper entitled *Learning from NUMMI*. Womack et al. (1990) published a book entitled *The Machine That Changed the World*, exploring the implementation of lean practices in the automotive industries worldwide.

2.1 Lean Manufacturing and its Practices

In the early 1980s, Japanese firms were leading the world's automobile manufacturing sector with low-cost, best quality products and JIT delivery systems due to the Toyota Production System (TPS). TPS has two main components: JIT production system and a respect-for-human system that focuses on active employee participation, elimination of wasted movement by workers, consideration for workers safety and self-display of employees capabilities by entrusting them with greater responsibility and authority (Sugimori et al., 1977).

2.2 Applications of Lean Manufacturing

In recent years, there have been a large number of articles published by various authors in academic journals on implementation of lean manufacturing into various manufacturing industries, such as in the electronics industry, aerospace industry, oil-related industry, textile industry, camshaft manufacturing industry, machine tool industry, service industry, distribution industry, steel industry, forging industry, die-casting industry and in the foundry industry

(Torielli et al., 2011; Hines and Rich, 1997; Doolen and Hacker, 2005; Haque, 2003; Haque and Moore, 2004; Keogh and Bower, 1997)

3.Conclusion

Lean manufacturing is a concept to reduce the waste in manufacturing system. Waste may be in the form of inventory, waiting of machines and human resources, unnecessary transportation of machines and materials, product (work in process , finished product) etc. Lean concept is relevant in present and also in future. This concept can be implemented in any type of industry such as foundry industry, forging industry, welding shop, automotive industry and so on. When this is implemented in the the industry then it will increase profit and productivity.

4.Future work: This paper presents brief literature review for the concept of lean manufacturing. Detailed literature review can be carried out in future. Also study can be done for its feasibility of implementation process .

5.Limitations of the Study: The study has been restricted to production area mainly.

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