Lean Manufacturing - an Advanced Manufacturing Technique for Auto Industries.

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Abstract — With ever shrinking time to market, companies are constantly seeking new ways of producing customized parts cost effectively. Could this be done without resorting to the traditional manufacturing processes? This is the age of new manufacturing. With accelerating technological changes as increasing compactions at both local and global market place, only those companies, which are both flexible and agile, will survive in the future.

The dawn of new century begins with it, new rules of competitions, concepts such as supply chain management, flexible manufacturing and lean organizations have become preconditions for companies that seek to compete in the long term.

This paper explains about “Lean Manufacturing - an Advanced Manufacturing Technique for Auto Industries”. Lean manufacturing system is modern production strategies that uses less resource such as human effort, production space, investment in equipment and machine, time for developing new products and services and performs the process as rapidly as possible. Lean manufacturing combines with best features of craft production (high quality, individual custom made product) while mass production (manufacturing at great quantities to satisfy broad customer needs at lower prices ) outcome of lean thinking is- zero inventory, zero down time, zero delay and zero defects.

Lean principles have been employed successfully worldwide in the auto industries and being increasingly employed in many other industrial sectors

Keywords— Lean Manufacturing, Just in Time, Cellular Technology, Supply Chain Integration, Kaizen.

I. Introduction

Despite enjoying nearly ten years of globalizations, most of the Indian automobile manufacturer steel follow the customize mass production (batch mode) system. Consequently they suffer from abnormally high inventory levels, high cycle times and enormous wastage. It results in increase inventory cost, which in turn elevate cost of production. And the high cycle time lead to reduced customer satisfaction. Manufacturer cannot afford the compliances that they enjoyed in the pre liberalizations era. Why? Because the global villages are continuously spreading with new players and innovations, taking the competitions and quality standards to a new height.

Given this scenario, it is high time the automobile manufacturer quit the traditional path and plunged in to something more innovative and productive. The lean manufacturing technique is a tried and tested system that carries many promises for the Indian automobile manufacturer.

Over the past 10 years or so, lean manufacturing has been receiving an increasing amount of attention as one source for productivity improvements and cost reductions in manufacturing. Hailed by its proponents as a breakthrough means to analyze and improve production and the factory floor environment, lean manufacturing is an abroad collection of principles and practices that can improve corporate performance. The argument is that lean manufacturing offers revolutionary rather than evolutionary efficiency improvements.

II. What Is Lean Manufacturing?

Lean manufacturing a production strategy that aims at high levels of production using lesser effort, time and material. It is a combination of Japanese’s concept and technique that works together to improve the productivity of the organization, and consequently elevate the organization to a competitive position. It is an integrated business approach adopted to eliminate non-value added activity from the customer delivery cycle in the operation. This approach enables the companies to response quickly and profitably and changes in customer demand.

Many people wrongly confine “lean” to the shop floor; actually lean is the way of thinking, and attitude. The technique of lean can be applied to every situation in a company, by finding out what the customer want, eliminating, waster from process and making the value flow continuously according to the customers pull. The idea is to create a culture in which people in an organization are continuously improving their productivity every day, in every way.
III. The Concept of Waste

It is essential to be able to understand an identify what we mean, by wastage in an organization. Simply if it doesn’t add value, it is waste. According to Boeing the term “waste” indicates unnecessary complexity in work, processes, redundant labor, excessive production, unimaginative use of space, loss of energy, high rate of defect, unnecessary use of material, loss of time and unrequited transportation.

A western has been the bone of manufacturing sector that directly affects the bottom line. Though unavoidable, it is possible to cut to waste through proper planning and efficient work process. Through the implementations of the lean manufacturing system, the company intends to organize the system by identifying and eliminating the waste the ultimate aim being to increase productivity, customer satisfaction and revenue.

IV. Key Lean Principles

Eliminations of the waste is the fundamental principle of lean manufacturing and to achieve this following principles should be practice.

LM’s essences lies in producing with as few people as little inventory and as little waste as possible.

Lean ensures that each production stage processes exactly “what”, “how much” and exactly “when” the next stage wants it.

Lean allows enormous variety in product without the kind of change over cost that customizes mass production involves.

Four Pillars of LM

Four pillars namely,

1) Just In Time (JIT) concept
2) Supply Chain Integration
3) Cellular Technology and
4) Kaizen

1. Just In Time Concept

The JIT concept requires the raw materials for each steps in a process to reach the shop floor at exact time and not earlier. This leads to a huge fall in the inventory cost. The goal JIT is achieved by using techniques like standardizations of processes, TPM and Kanban. Throughout lean manufacturing and ultimately through JIT. The manufacturing unit can achieve following goals.

Reduce set time.
Guaranty that material will be there without excess handling.
Guaranty of machine availability and reliability.

Advocate of JIT claims it is a revolutionary concept that all manufacturers have to adopt in order to remain competitive. Also known as Kanban is continuously reduce product cost by storing the elimination of waste; no reject, no delay, no stock piles, no idleness and no useless motion.

To achieve low cost high quality, on time production, the JIT system removes stock accumulations between successive operations. It does so by organizing around a production quantity of “1” which means the ideal lot size for each part is 1. Because no safety stock is allowed, no part can faulty. The responsibility for eradicating defective work and equipments failures is placed on individual operations. Output Quotas are inviolable and fluctuations in daily schedules are minimizing to maintain nearly uniform flow rate. Results from applying these principles, along with a concentrated effort to improve productivity, have frequently been spectacular.

2. Supply Chain Integration

The lean system can be effective only if it is executed all along the production chain i. e. from the supplier’s supplier to customer’s customer. Every link along this chain is affected if a single member does not deliver. It is a long process involving several interfaces, and so manufacturers need to take steps towards strategic sourcing and organizing the supply base.

3. Cellular Technology

In the traditional batch mode or assembly line manufacturing process, the lay out of shop floor is done according to the activities. Not so in the lean manufacturing system, where manufacturing cell is designed to process parts of the product in separate fixed areas, thus eliminating non value-added activities. Ultimately, the layout creates a single-piece flow. This reduces the order flow time, work-in-progress, material handling cost, and so on, thus elevating customer satisfaction and profits.
4. Kaizen

Lean manufacturing produces optimum results only if it is implemented as an ongoing improvement process, involving everyone at every level.

Kaizen technique is another essential for lean manufacturing system. Masaki Imai, the founder of kaizen institute, expounds kaizen as “Continuous Improvement, without spending much money……… using common sense”. It doesn’t cost money but it changes the way people do the job. It is about making the most about 5-M of the organization i.e 1. Manpower 2.Material 3.Method 4.Machine 5.Measurement

The practice of this technique is based on strong assumption that every individual or group of individuals always carries a hidden capacity to keep on improving the output in terms quality and quantity. The goals of kaizen are:1) Continues improvements & Self-motivation and development.

V. How Does Kaizen Works?

Kaizen is top-to-bottom programme. It is responsibility and interest of the top management to inspire the human resource of the organization and inform them about what’s, Why’s, and How’s of kaizen. The basic steps to incorporate kaizen as an enterprise-wide programme consists of the 4I’s.
1. Inspire 2.Inform 3.Implment 4.Improve

VI. Implementation of Lean Manufacturing System

After understanding the concept and basic principle of lean manufacturing it is important to see how it is implemented because theory without practice is sterile and practice without theory is futile. The process of going “lean” starts with attitude level, not at the shop floor level.

VII. For Implementing Lean Manufacturing

First requirement is a clear vision in top management second would be the cultivation of the right attitude or work culture, which would perhaps be more important than superb products, good ideas or technical innovations. The third need for championship mentality and team work. So far the implementation of lean manufacturing is the company particularly for the small scale manufacturing units. The arrangement has to bring about the following TECHNICAL CHANGES:

1) The first step towards the lean production is to make such process of consistent and predictable production.

2) Standardize the process sequence for all this similar looking / type / category parts, which may have minor difference in size. This will help in shop layout for continuous material flow.

3) Make the fixture, holders, tolling, adaptable to all parts with zero or minimum setup change time.

4) Simple and autonomous machines.

5) Preventive maintenance of machine for zero breakdowns during production.
The management should also bring about the following ADDITIONAL CHANGES:

1) Converting skill and will into military drill.
2) Pre-emptying future problems at planning stage.
3) Catching defect upstream.
4) Checking to be done to ensure safe future production.
5) Responsibility to be passed on downwards.
6) Use of statistical tolls and imbibe statistical thinking particularly cause and effect and frequency distribution.
7) Satisfy customer expectations. Lean manufacturing works in association with Total Productive Maintenance (TPM). TPM aims at zero accidents, zero breakdowns and zero defects. TPM again is enhanced by the calculation of Overall Equipment Effectiveness. (OEE)

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OEE = \text{Availability} \times \text{Performance Rate} \times \text{Quality}
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VIII. Advantages of Lean Manufacturing

1) Since LM involves the JIT inventory levels (raw material, WIP, finished goods) can be brought down to nearly nil, thus reducing cost
2) LM uses simple multitask machinery where by product of different design can be produced on the same machine.
3) Transition between various designs takes only a few minutes. This enables increase in flexibility and better response to customer requirements.
4) It also reduces customer lead time, cost of production and wastage.
5) LM is an effective competitive tool, not in then least due to dramatic saving in productivity and cycle time to WIP inventory. LM helps to unleash the power of the work force, ultimately taking the organization to, a competitive position.
6) Hence LM about making the company trim, fit, strong and swift.

X. Hurdles/Obstacles On Lean Path

An organization that wants to get lean may face a few problems that require serious thought. Obstacles in transformation to lean enterprise:

1) Top management lacks strategic understanding of lean.
2) Lack of specific skills or knowledge regarding lean enterprise.
3) Culture, ego, organizational inertia.
4) Management reluctance to empower employees.
5) Fear of change of loss of organizational power.
6) Internal system causing hurdles.
7) Old engineering concepts.
8) Inflexible accounting methods.

Manager to coach is difficult change and it is to be expected that there would be initial difficulties. People would go through stages of refusal, anger, bargaining and finally accepting the change but stay firm against initial resistance and battle would be own

XI. Lean Manufacturing In India- Is It Too Late?

In the Indian economy, one of the areas identified as a problem is the high cost of financial intermediation despite the considerable availability of funds with banks. Indian manufacturing sector has to learn to reduce its debt-equity ratio. It is true that Indian industry would not be in a position to achieve competitiveness unless and until it gave up the legacy of looking to the government for solutions and its emphasis on “administration” rather than on management and leadership. The relentless pressure on prices as a result of heightened competition that several sectors of the Indian economy face and the positive results that some Indian firms have achieved in facing the crisis through “lean manufacturing” show that it is high time Indian firms adopted the
Toyota Production System. This system has already been introduced and practiced in manufacturing sectors of many developing countries especially in South-East Asian economies in the sectors such as steel, textiles and even in some services.

Hence, it is vital for Indian firms to shed the obsession with economies of scale and learn to make the most out of existing capacities and machinery and in this respect the role of lean manufacturing is of strategic importance. Lean manufacturing, that forms a triad along with total quality maintenance and total productive maintenance, is the only option left for Indian firms to meet two vital ends -- improvement in quality and at the same time cut costs of production and operations. With the elimination of waste, lean manufacturing techniques would help Indian firms become suppliers or partners of MNCs with their exacting demands instead of either being taken over by MNCs or being driven out of the market by them.

XII. Conclusion

With increasing foreign competitors especially China all the businessman in India, need to rethink about these business on a war footing. With the adoption of LM the working space requirements have been reduced productivity, gains have been of order of 30-40% the inventories of raw material and components work in process and finished goods have came down. There, reducing the working capital needs and interest burden. The quality of total service has noticeably improved leading to “delighted customers, loyal customers”. Thus, beating the competition.

It may be noted that the most important part required for implementation of LM is the commitment from top management and championship mentality in the minds of our manufacturers.

It is precisely for Indian industries that LM is an essential tool to respond quickly to customer, to work effectively and to reshape their business.

References