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## LEAN MANUFACTURING PRACTICES: PROBLEMS AND PROSPECTS

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**ABSTRACT:** Lean is about generating more values for buyers by removing activities that are regarded waste. Any activity or process that consume resources, adds cost or time without creating value becomes the target for elimination. Lean Manufacturing is an efficient way to identifying and eliminating waste through incessant improvement. Lean is about doing things in less time, inventory, space, people, and money. The core objective of Lean production is elimination of waste in production, maintaining customer relations, product design, supply chain and factory management. This paper is an attempt to study issues and challenges pertaining to Lean Manufacturing Practices in modern day organizations with special reference to gear industries.

**KEYWORDS:** Lean, Waste, Elimination, Management, Production

### INTRODUCTION

The basic ideas behind the lean manufacturing system, which have been practiced for many years in Japan, are waste elimination, cost reduction, and employee empowerment. Lean Manufacturing started as the Toyota Production System (TPS), developed by the Toyoda (now Toyota) Motor Car Company. Womack coined the phrase "Lean Manufacturing". Lean is more than just a set of tools and techniques. It is a fundamental way of thinking about a process, which focuses on value creation and waste elimination. Lean Thinking methods can include all employees and can bring changes in the attitudes of the individuals that make up the organizations.

### REVIEW OF LITERATURE

Jim Womack, Daniel Jones and Daniel Roos (1990) state that lean manufacturing is the systematic elimination of waste. Karlsson and Åhlström (1996) highlight that lean aims to increase productivity, reduce lead time and cost, and improve. Liker and Wu (2000) elaborate lean as a philosophy of manufacturing that focuses on delivering the highest quality product on time and at the lowest cost. Hines, Holweg & Rich (2004) remark that lean has undergone a significant evolution and development and has attracted more attention to be applied in the service sector. Dennis (2007) finds that the foundation of the lean system is stability and standardization. Wilson (2010) says that lean system strives to make one piece at a time; this is true one piece flow.

### GAPS IN THE REVIE OF LITERATURE

Following gaps are identified from the structured review of literature:

Gap 1: Lean Manufacturing Practices in Gear Industries is not fully explored and not much has been done in Indian context.

Gap 2: Very little literature is available on Lean Manufacturing Practices in Gear Industries.

Gap 3: The organizations are not able to reap out the benefits of Lean Manufacturing Practices due to lack of planning and proper awareness.

The core objectives of LMS:

- Decreases the administrative costs.
- Focuses on waste elimination.
- Impetus on needless cost generating points.
- Have a good control over mundane activities.
- Eliminates the cycle time.
- Socially answerable techniques.
- Promotes environment friendly practices.

### BENEFITS OF LEAN MANUFACTURING

Manufacturing strives to eliminate all waste from the manufacturing process. This can mean eliminating unnecessary costs, tools or processes. Most commonly, lean manufacturers study their processes to see if they can eliminate unnecessary movement.

- Reduction in overhead operating costs
- Saves space.

- Quality control
- Sales per employee is higher
- Sales doubles
- Profits soars great heights of success
- Lead time cut by 50% to 90%
- Process queues cut by 70%
- Less frustration on-the-job
- Continuous improvement

### EIGHT TYPES OF WASTE TARGETED BY LEAN METHOD

It is interesting to note that the “wastes” typically targeted by environmental management agencies, such as non-product geo-output and raw material wastes, are not explicitly included in the list of manufacturing wastes that lean practitioners routinely target.

Table No 1. Eight Types of Waste Targeted By Lean Methods

Defects	Production of off-specification products, components or services that result in scrap, rework, replacement production, inspection, and/or defective materials
Waiting	Delays associated with stock-outs, lot processing delays, equipment downtime, capacity bottlenecks
Unnecessary Processing	Process steps that are not required to produce the product
Overproduction	Manufacturing items for which there are no orders
Movement	Human motions that are unnecessary or straining, and work-in-process (WIP) transporting long distances
Inventory	Excess raw material, WIP, or finished goods
Unused Employee Creativity	Failure to tap employees for process improvement suggestions
Complexity	More parts, process steps, or time than necessary to meet customer needs

Eight core lean methods are described below:

1. Kaizen
2. 5S
3. Just-in-time Production
4. Total Productive Maintenance (TPM)
5. Cellular Manufacturing / One-piece Flow Production Systems
6. Kanban
7. Six Sigma
8. Pre-Production Planning (3P)

### PRINCIPLES OF LEAN MANUFACTURING

Following are the main principles of the lean manufacturing:-

1. Identify Value
2. Map the Value Stream
3. Create the Flow
4. Establish Pull
5. Seek the Perfection



Figure No. 1: Principles of Lean Manufacturing

Today the lean concepts have reached many other industries including healthcare, service providers and even military. The variety of organizations that are practicing lean concepts or lean thinking in them goes to show the universal applicability of lean concepts or lean thinking. Lean technologies may be unique to the implementation but the lean thinking is universal. In any organization, Lean can be implemented in production, planning, engineering / maintenance, sales, marketing, R and D, store etc.

### DEPARTMENTS PRACTICING LEAN – IT ENABLED TECHNOLOGY

Selecting the most appropriate lean techniques or tools and the accompanying packaged enterprise software for an individual enterprise has never been that simple. In fact, it is a major exercise for an enterprise to initially identify the most appropriate tools for eliminating different types of waste. For instance, overproduction could be mitigated by improved changeover times and balanced lines, whereas defects and rework could be curbed by improving visual controls, initiating more complete standard operation procedures (SOP) or operation method sheets (OMS), and implementing mistake proofing techniques at the source of error. Furthermore, waste of excessive inventory could be reduced by implementing kanbans and other similar pull systems, while waiting time could be handled by using takt times, and so on. With Lean IT, technology can lead the way in providing value across the enterprise, but it is the alignment with business strategy and the proper governance model that will ensure success and achieve measurable results. Forward-thinking organizations are already well along this path.

IT can be used to automate existing process, where the existing manual process put into a system to automate the process. The other area is where IT is a trendsetter, which is, where it comes with new

methodology and dictates the process. Many organizations have placed customer relationship management (CRM) systems online as part of their web site. A customer can login and create a trouble ticket online for a support or service request instead of talking to a customer support representative on the telephone. Many organizations are using self-service frequently asked questions (FAQ) sections on their web sites where customers can see if their problem has been faced by other customers, and what the solution was, in those cases. Business process management systems (BPMS) enable streamline and integrate different software systems that may be involved in a business process. By providing an overall framework for the business process, BPMS systems enable smooth flow of business processes across different departments, functions and backend software systems. The service-oriented architectures (SOA) technology enables software systems in the same or disparate organizations talk to each other and exchange information automatically, without any human intervention.

#### **ROBOTICE IN LEAN AND ADVANTAGES OF LEAN**

Robots could be an acceptable automation solution that adds value to Lean Manufacturing System. While small manufacturing systems can be easy to design with limited need for software based validation, larger systems involving multiple robots, tooling fixtures, humans, etc. need to be validated and optimized prior to system build to ensure that the robotic system behaves as predicted. One tool that is being used heavily in the robotic automation engineering business is robotic simulation software to validate robot reach, robot cycle times, robot motion paths and envelopes, robot positioning within the system, to name a few benefits. Most production lines are designed to be a cooperatively productive and efficient effort between humans, tooling, robots, etc. While it is difficult to ensure strict consistency in humans, robots and machinery can be programmed to be at their optimized best. An efficient automated robotic station ensures that stations ahead of the line are not tied down ensuring better lean performance. Thus, the use of robots in lean manufacturing can save time and materials by simplifying production.

Lean manufacturing not only reduces operational costs but also targets to boost, restore and significantly raise the competitiveness of a company. Several advantages of adopting lean manufacturing principles. The first advantage identified by experts from implementing lean manufacturing techniques and strategies is the reduction of manufacturing time. Thus, lean manufacturing helps companies retain, maintain and significantly increase their earnings, widen their margins and help them generate savings from lower costs. Space is another area where lean manufacturing advantages are clearly and effectively exhibited.

It is found that in general, companies implementing and adhering to lean manufacturing practices significantly boost and increase their manufacturing productivity. The advantages in terms of waste to profit relationships It follows that elimination and reduction of wastes will gradually and efficiently help boost and raise up earnings and profits in companies.

The advantage of that, above all is that, when customer satisfaction is achieved, sales will surely rise. The best way to establish a good relationship with customers is to improve the products and services offered to them. Lean manufacturing would be of great help to achieve a good customer or client relations.

Another advantage brought about by lean manufacturing techniques among various companies and firms adopting it worldwide is streamlined, rationalized or lean structuring of the organization.. In lean manufacturing, the cultures are standardized, thus, unfavorable practices and behaviors of both the employees and the management are reduced, if not eliminated.

#### **EFFECTIVENESS IN COST REDUCTION AND ELIMINATION OF WASTE**

One of the goals of Lean Manufacturing is to locate waste pragmatically in each process and then eliminate it. It is possible to uncover a very large amount of waste by observing employees, equipment, materials and organization in the actual production line from the perspectives of the process itself and the actual work involved. Some types of waste are obvious, but others are hidden. Waste never improves value; it only increases cost. The thorough elimination of waste leads to greater employee self-respect and to major cost reductions by preventing unneeded losses.

#### **MANUFACTURING PROCESS: ISSUES AND CHALLENGES**

It is well known fact that by application of LMS any organization can reap the benefits of the available resources. Many companies who implement Lean do not adequately take advantage of the improvements. Highly successful companies will learn how to market these new benefits and turn them into increased market share. Even in the age of modern technology & globalization some employees are not aware about a system that can be handy for there professional growth and betterment of working environment. With the application of LMS there is unseen danger of rejecting or overruling of certain existing technique & tools in an organization.

The success of LMS highly depends upon various factors but the key factor is perception of employees and working of the management. Though LMS is not a very old technique to strengthen the

quality & production in any organization, yet it requires a deep understanding, knowledge and skills to apply it successfully in a given frame work. Training provides employees a golden opportunity to hone their latent skills and enable them to become aware about the latest trends & technologies. Since LMS is a new phenomenon so employees require undergoing training seriously. But some times organization thinks that training is an extra financial burden that may reduce their share of profit & of no use for their employees.

LMS is considered as a very useful technique in the modern day setting of organization. it is very beneficial in reducing the cost and waste management. The success of LMS heavily depends upon planning and implementation of plans & policies. Total quality management is the need of hour organization like to have total quality in their management system. 6 Sigma also meant to improve the quality & production without increasing the cost of production. LMS can be very beneficial in implementing TQM & 6 Sigma.

Employees like to see their career graph moving. They like to be in constant touch with the latest technologies. They can contribute a lot to their working organization, if they get proper training & guidance along with healthy working environment. There are organizations that take training as a very important aspect for employees' growth. The objectives of LMS can be achieved by providing regular and rigorous training to the employees. Training programmes can be planed as per the requirement of employees and the organization.

### RESEARCH PROBLEMS AND SUGGESTIONS

Currently, in India about 150 companies in the automobile industry use lean manufacturing, but it is yet to permeate other areas. The manufacturing industry in India must also look to leverage its advantages, its large domestic market, good conditions in terms of raw materials and skilled labour, and the quality focus. Some of the hurdles that the country faces, on the other hand, include the lack of scale, and the low investment being made in technology and infrastructure. To safeguard the interest of these manufactures in the long run in the Indian economy, the manufacturers need to be competitive simultaneously maintaining the quality standards which could be possible with implementing lean techniques in their system. Japanese are known to be Pandits of Lean manufacturing techniques. Indian automotive market is not new to Japanese manufacturers; they have been here for good number of years. There are multifarious reasons behind it. In our country at the state level, there are few companies that are implementing Lean manufacturing techniques. In Dewas, the industrial town of Madhya Pradesh, some of the automobile companies and gear industries are vigorously following the Lean manufacturing techniques to eliminate waste and downsize the cost.

In this research study, an attempt is made to study Lean Manufacturing Practices in the Gajara Gears Ltd, Dewas and find out how lean manufacturing tools when used appropriately can help the company to eliminate waste, have better inventory control, better product quality, and better overall financial and operational procedures.

This research study is quite successful in marking following problems that are being faced by the Gajara Gears Ltd along with their remedial measures in form of proposed methodology. Use of Lean tool Kaizen, avoided the problem of wastage of broaching oil during reloading the component in trolley after broaching. Kaizen drive Gajara Gears Ltd employees to look out for new opportunities to improve their work, workplace resulting in productivity improvement. The management has to be very cautious at the time of implementing Kaizen.

#### **Problem No: 1 - Why Wastage of Oil during Broaching Occurs?**

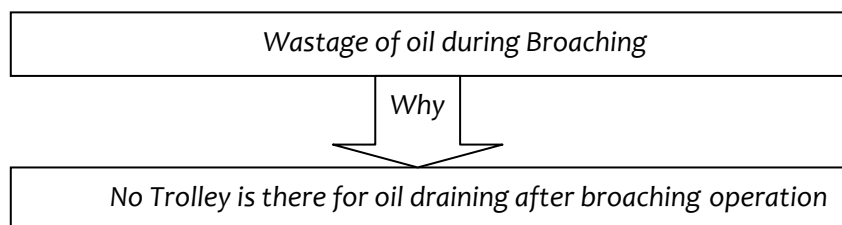


Figure No. 2: Wastage of Oil During Broaching

Suggestions: An oil trolley is placed near the machine on which operators are instructed to keep the job after broaching after soaking of broaching oil they are reloaded. The Gajara Gears Ltd is using 5S for pleasant work environment and unleashing the potentials of human resources. It enables the company to simplify work environment and reduce waste and non-value activity while improving quality, efficiency, and safety. The 5S focuses on effective workplace organization such as arranging the record of account section, change gear arrange in a separate rack and tool arrangement in separate hangers, the result of which is reduction in search time, travel time and visual control.

**Problem No: 2** Search time for accounting department is high so that delay in work.

Present Methodology



Proposed Methodology



Figure No. 3: Account Section Arranging the Record

Suggestions

- Categorizations and labeling of records should be done on regular bases.
- All records should be kept at one place.
- Visual control should be added.

Benefits for the Company

- Reduced Retrievals Time.
- Reduced Travel Time.

**Problem No: 3** - Change gear required search time is high.

Present Methodology



Proposed Methodology



Figure No. 4: Change Gear Arranging the Separate Rack

Suggestions

- Change Gears should be kept under Machine Tray, Which can be replaced in separate Rack.
- Categorization of Gears should be done.

Benefits for the company

- Reduced Search Time.
- Better Visual Control.

**Problem No: 4** - Tools difficult to identity and search time high.

Present Methodology



Proposed Methodology



Figure No. 4: Change Gear Arranging the Separate Rack

Suggestions

- Categorizations and labeling of tool can be done.
- All tools should be kept at one place.
- Visual control may be added.

Benefits for the company

- Reduced Retrievals Time.
- Reduced Travel Time.
- Tools can be easy to identity

Thus, the results of the study were a success with the implementation of using lean principles. Production personnel were instrumental to the success of each Kaizen event. By applying their knowledge to the processes allowed the teams to provide the best solutions to the issues within the process. The Gajara Gears Ltd should aware and understand the lean concept and purpose, because the main barriers of the company are the lack of real understanding of lean manufacturing concept and employees' attitude. This finding has implication for the firms as it provide a mean to help them to

identify the factors that hinder or delay the implementation process. The management should understand and emphasize the importance to overcome these resistances for the successful implementation of lean manufacturing practices.

Implementing a lean program is not an easy task. It requires extensive work both within and outside the organization but at the end it will yield long-term benefits. Tools & techniques should be applied successfully in order to attain the objective of LMS. This can be achieved with the integrated approaches of LMS. The employees & employer should develop a better understanding & contribute their share in a healthy environment. Even though piecemeal implementation of lean practices may not gain full benefits, but the step taken could help Gajara Gears Ltd to improve their performance gradually.

Therefore, it is important to address the barriers to implementing lean practices and eliminate them by doing the following:

- Provide executive training
- Create a road map
- Review metrics and measurements
- Work with supply chain network
- Employ a value stream manager

Being systematic about eliminating waste will give Gajara Gears Ltd a better chance at sustaining the momentum when someone engages and eliminates waste in its work. To reduce the waste of waiting, it should reduce queue size, point of use storage, deployment of visual systems, improving planning and load. There are certain obstacles in the implementation of Lean Manufacturing Practices. But they can be overcome by successful planning.

#### CONCLUSIONS

Successful implementation of any technique largely looms upon various factors. The application also requires coordination and combination of various tools and techniques without which success of LMS may be doubtful. It is the duty of the management to recognize and prevent obstacles that may create flaws in successful implementation of LMS.

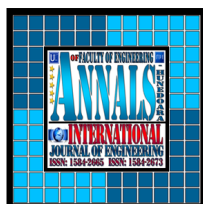
No tools & techniques are flawless. There are certain obstacles in the implementation of LMS. But they can be overcome by successful planning. In the application of LMS, the biggest obstacle appears is the non-recognition of LMS as an effective tool. Their financial benefits are mostly not recognized by the organization. It is very necessary to overcome this hurdle. In the era of globalization, all organizations try to improve productivity and quality using all industrial engineering techniques. Lean manufacturing is a dominant tool which is proven globally as one of the best tool available to improve overall operating efficiency.

#### FUTURE SCOPE FOR STUDY

- This study will further assist the gear industries to gauge their level of leanness and will serve as a foundation for future research
- Future research should include multiple organizations with a longer history of lean manufacturing.
- This study will be helpful in developing case studies on how Industrial design can influence operations strategy.
- The linkage between Lean Manufacturing factors and operational performance still needs to be explored, as well as the single Lean Manufacturing practices' role in the framework need to be studied.

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