

A

Seminar report

on

**Lean Manufacturing**

Submitted in partial fulfillment of the requirement for the award of degree  
Of Mechanical

**SUBMITTED**

**TO:**

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## Preface

I have made this report file on the topic **lean manufacturing**; I have tried my best to elucidate all the relevant detail to the topic to be included in the report. While in the beginning I have tried to give a general view about this topic.

My efforts and wholehearted co-corporation of each and everyone has ended on a successful note. I express my sincere gratitude to .....who assisting me throughout the preparation of this topic. I thank him for providing me the reinforcement, confidence and most importantly the track for the topic whenever I needed it.

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## Introduction

Lean Manufacturing can be thought of as a systematic approach to reducing waste in the production process. In this sense, waste is anything (activities, processes, tools, materials, personnel) that does not add value to the product or service as viewed by the customer.

In the 1940s Taiichi Ohno and Shigeo Shingo improved upon previous manufacturing breakthroughs — interchangeable parts, time and motion measurement, assembly lines—to create the Toyota Production System (TPS), the principles and practices of which eventually also became known as Just-in-Time (JIT) manufacturing.

This groundbreaking thinking catapulted Toyota into the global spotlight, and its processes became premier industry practices that everyone aspires to emulate. Because TPS pares manufacturing down to the bare essentials needed for high-quality production, the approach took on yet another telling name in the 1990s: Lean Manufacturing.

In an effort to better understand the true definition of waste, Lean divides the various types of waste into seven categories:

- Overproduction
- Waiting
- Transport
- Over processing
- Inventory
- Movement
- Scrap or defects

Best thought of as symptoms of larger problems, the wastes are like the tips of icebergs. They indicate problems that are out of sight and that can run much deeper.

Problems are compounded because, without TPS or Lean, manufacturers tend to treat symptoms only and rarely identify root causes. Original problems recur and new ones can even be created, because they just receive a quick fix and are not truly solved.

A typical example is a company that has excessive rework. Customers ultimately receive products but only at the expense of longer lead times, higher inventories, and greater costs to the company.

It isn't until inventory levels are reduced that the focus shifts toward finding the root cause of excessive rework and scrap problems. In an effort to solve delivery issues, companies might create greater inventories than needed.

Such inventories are like rivers that cover rocks hidden below the surface. As inventories (water levels) are reduced, many hidden problems unrecognized in the past become visible.

In a true Lean environment, inventory levels are reduced, hidden problems revealed, and solutions developed in a way that supports team concepts, collaboration, new ideas, and a common goal: satisfying the customer.

This approach, and the results it produces, is one of the great differences between Henry Ford's breakthrough processes and Toyota's. Ford was very good at producing one specific type of automobile without variation. (He once famously said, customers could buy Ford cars in "any color so long as it's black.") Toyota's processes, on the other hand, allow quick changes that result in delivery of specifically what the customer wants.

Lean Manufacturing has inspired many new ways to eliminate waste. Some include tools such as SMED (single-minute exchange of die), cellular manufacturing, Kanban (a signaling system that facilitates quality improvement), and mistake-proofing, to name just a few. Lean Manufacturing has evolved so that it's now also referred to as Lean Thinking.

## What is Lean Manufacturing?

"A systematic approach to identifying and eliminating waste (non-value-added activities) through continuous improvement by flowing the product at the pull of the customer in pursuit of perfection."

## History

### Lean was born in the U.S.A

- Ford production system established (1913)

### Lean was first practiced in Japan

- Toyota Production System (revealed in 1973)

### Lean has spread world wide

- World class Lean performers develop in the U.S.A. (1990s)
- Lean increasingly integrated into corporate strategies
- Manufacturing
- Education
- Banking /Finance
- Retail
- Software.

## **KEYS TO LEAN SUCCESS**

Following are some considerations to successful lean implementation:

### **Prepare and motivate people**

- Widespread orientation to Continuous Improvement, quality, training and recruiting workers with appropriate skills
- Create common understanding of need to change to lean

### **Employee involvement**

- Push decision making and system development down to the "lowest levels"
- Trained and truly empowered people

### **Share information and manage expectations**

### **Identify and empower champions, particularly operations managers**

- Remove roadblocks (i.e. people, layout, systems)
- Make it both directive yet empowering

### **Atmosphere of experimentation**

- Tolerating mistakes, patience, etc.
- Willingness to take risks

### **Installing "enlightened" and realistic performance measures,**

### **Evaluation, and reward systems**

Do away with rigid performance goals during implementation

- Measure results and not number activities/events
- Tie improvements, long term, to key macro level performance targets (i.e. inventory turns, quality, delivery, overall cost reductions)

After early wins in operations, extend across ENTIRE organization.

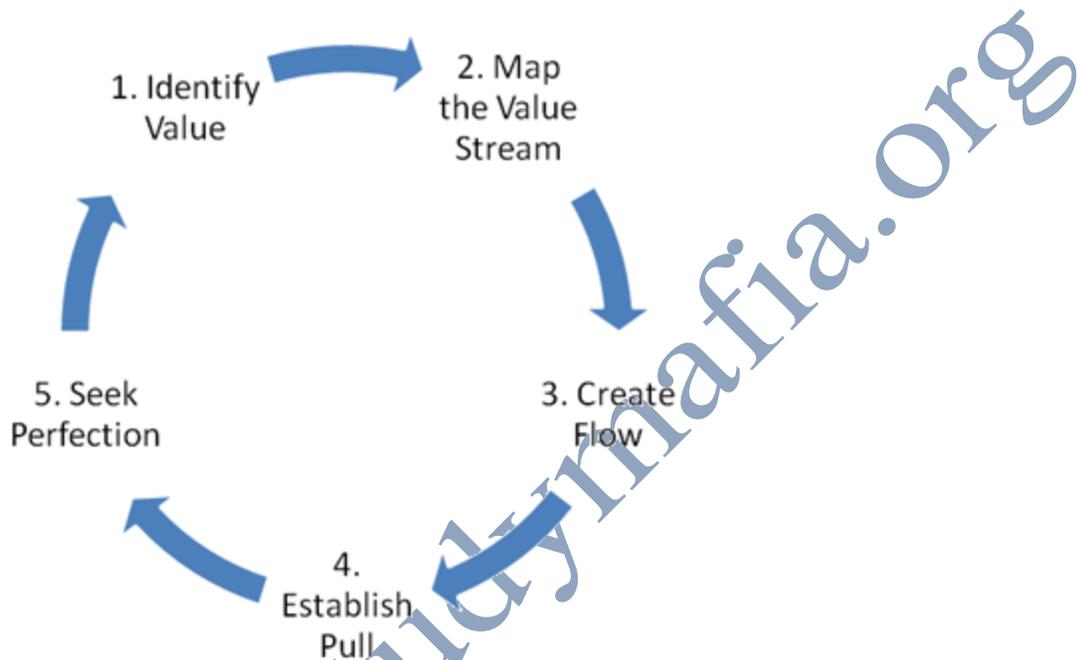
## **COMPARISON BETWEEN TRADITIONAL AND LEAN MANUFACTURING**

For years manufacturers have created products in anticipation of having a market for them. Operations have traditionally been driven by sales forecasts and firms tended to stockpile inventories in case they were needed. A key difference in Lean Manufacturing is that it is based on the concept that production can and should be driven by real customer demand. Instead of producing what you hope to sell, Lean Manufacturing can produce what your customer wants with shorter lead times. Instead of pushing product to market, it's pulled there through a system that's set up to quickly respond to customer demand.

Lean organizations are capable of producing high-quality products economically in lower volumes and bringing them to market faster than mass producers. A lean organization can make twice as much product with twice the quality and half the time and space, at half the cost, with a fraction of the normal work-in-process inventory. Lean management is about operating the most efficient and effective organization possible, with the least cost and zero waste.

## Principles of Lean

The five-step thought process for guiding the implementation of lean techniques is easy to remember, but not always easy to achieve:



1. Specify value from the standpoint of the end customer by product family.
2. Identify all the steps in the value stream for each product family, eliminating whenever possible those steps that do not create value.
3. Make the value-creating steps occur in tight sequence so the product will flow smoothly toward the customer.
4. As flow is introduced, let customers pull value from the next upstream activity.
5. As value is specified, value streams are identified, wasted steps are removed, and flow and pull are introduced, begin the process again and continue it until a state of perfection is reached in which perfect value is created with no waste.

## Benefits

- Reduced scrap and waste
- Reduced inventory costs
- Cross-trained employees
- Reduced cycle time
- Reduced obsolescence
- Lower space/facility requirements
- High quality & reliability
- Lower overall costs
- Self-directed work teams
- Lead time reduction
- Fast market response
- Longer machine life
- Improved customer communication
- Lower inventories
- Improved vendor support and quality
- Higher labor efficiency and quality
- Improved flexibility in reacting to changes
- Allows more strategic management focus
- Increased shipping and billing frequencies

## **Barriers to Lean Manufacturing**

The barriers in the Indian context of implementing the lean manufacturing are the following:-

- Lack of resources
- Lack of expertise
- Initial high cost which includes the cost of resources as well as expertise.
- Poor supply chain structure.- Ineffective training and development of work force in the company
- Absence of continuous assessment of every individual in the organization.
- Psychological factors such as fear of losing the job on account of its implementation.
- Natural calamities.

## 7 wastes of lean manufacturing



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1. **Overproduction:** A "just in case" mindset can often lead to overproduction or storing of extra products, which wastes storage space and production time and energy. You also have a problem if the customer decides later that they don't want

- the item anymore, or there are ordering delays and the product spoils before delivery.
2. **Inventory:** This is the other side of the "overproduction" coin. If you order extra raw materials so they're available "just in case," that's also wasteful. The order specs may change, food products may get wasted, or again, the customer may not want the product anymore.
  3. **Defects:** Defects and broken products can lead to customer dissatisfaction, and you spend extra time and money solving the problem, reworking the items, or paying for the customer to dispose of the waste. Shipping damage is also considered a defect.
  4. **Processing:** Also called over-processing, this is where companies expend more energy to produce their items through wasted movement and time. This could be a result of extra/unnecessary manufacturing steps, using older and outdated methods, or not having standard work plans.
  5. **Motion:** Unnecessary motion can happen as a result of an inefficient process, a lack of standardized procedures, or even a lack of training for employees. Wasted motion is a hidden cost because it's not something we can easily see, but only through careful observation and communicating with the workers.
  6. **Transport and Handling:** The thing we see the most, since it's our job, is shipping damage. But this muda is much more than that. It includes pallets not being properly stretch wrapped (wasted material), or a truck is not loaded to use floor space efficiently. Even in handling, it can be something as simple as forklift drivers who need to climb off and on the forklifts to set up or fix a stretch wrapping machine or using a pallet jack to hand deliver pallets to the stretch wrapping machine - all wasted motion.
  7. **Waiting:** These are bottlenecks in time, usually due to broken machinery, lack of trained staff, shortages of materials, inefficient planning, or as a result of the six other mudas. At their worst, they can lead to slowed production, delayed shipments, and even missed deadlines. At the very least, this is time that is paid for but unproductive; you're paying people to sit and wait.

## CASE STUDY

### The company:

The Parker Hannifin Aircraft Wheel & Brake Division

### The product:

Designer and manufacturer of aerospace commercial and military wheel and brake systems

### the challenge:

To reduce high finished goods, spares components and work-in-process inventory levels and the need to reduce long engineering and manufacturing cycle times.

The project objectives:

- 1. Reduce total Final Assembly (F-A) cycle time from 30 to 15 days.
- 2. Redesign F-A operations to:
  - a. Integrate product-lines where feasible;
  - b. Kit, build, pack & ship in one day;
  - c. Optimize available floor space;
  - d. Minimize operational transportation.

### Measured results:

- 1. Implemented "one-piece flow" philosophy;
  - a. Eliminated Build-to-Stock paradigm.
  - b. Reduced F-A Cycle Time from 30 to 4 days.
- 2. Saved approximately 3,200 sq. ft. of floor space (40 percent of area);
  - a. Integrated four product-lines into three;
  - b. Reduced Transportation up to 30 percent.

## CONCLUSION

“LEAN” can be said as adding value by eliminating waste being responsive to change, focusing on quality and enhancing the effectiveness of the work force. Although lean has its origin in the automobile industry it is being successfully used in other production industries.

Lean manufacturing is now extended to fields like I.T, service etc in order to reduce production cost and meet changing customer needs. Since lean is completely customer oriented it is here to stay. It is also important as it emphasis customer satisfaction.

Lean has made its way into curriculum of major universities around the world. In universities like MIT, Maryland university etc Lean manufacturing is included into the syllabus and it is given importance to new entrepreneurs.

Many consulting firms are also functioning for proper guidance to those who are interested in lean.

Lean manufacturing cannot be attained in one day or one week or one month or in a year. It needs lot of commitment and hard work.

Also there is no end in lean manufacturing. The more you eliminate waste the more you become lean. That is why it is said that:  
“lean is a journey”

**REFERENCES**

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