



Lean Manufacturing in Garment Industry

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Abstract

Manufacturers are now a days facing intensive global competition. They are becoming increasingly aware of the importance of modern management philosophy in providing them with a competitive advantage in a free market system. Now the key to competing in the international market place is to simultaneously improve both quality and productivity on continual basis. The major purposes of the use of lean production are to increase productivity, improve product quality and manufacturing cycle time, reduce inventory, reduce lead time and eliminate manufacturing waste. To achieve these, the lean production philosophy uses several concepts like Kaizen, Kanban, 5's, OEE, JIT etc. This paper clearly explains the lean concepts, its principle, importance and benefits. A clear study of different lean tools has been depicted. This paper also addresses the approaches to implement lean practices in apparel industry.

Lean Manufacturing

Lean Manufacturing is a systematic approach for achieving the shortest possible cycle time by eliminating the process waste through continuous improvement. Thus making the operation very efficient and only consisting of value adding steps from start to finish. In simple lean is manufacturing without waste

Lean manufacturing=half the human effort in the company +half the manufacturing space +half the investment in tools +half the engineering hours =to develop a new product in half the time.

Waste

- Waste is anything which does not contribute the product transformation
- **Non value added activities** in the process line Each and every organization wastes up to 95% of their resources, while most commonly this value exceeding 70%. Even the best lean manufacturer's wastes up to 30% of their resources.

7 Deadly Wastes

- *Over-Production
- *Inventory
- *Transportation
- *Defects
- *Motion
- *Extra Processing
- *Waiting
- *Under-Utilized Human Resources

Traditional Manufacturing Vs Lean Manufacturing

Lean manufacturing revolutionaries the manufacturing process. These manufacturing techniques are conceptually different from the traditional process.

Activity	Traditional	Lean
Inventory level	High level	Low level
suitability	For high order quantity	For low order quantity
Higher product design	Not suitable	Highly suitable
Cost of production	high	Low
Bundle size	low	High
Process waste	high	Low
Product inspection	Sample based inspection	100% inspection
Work in progress	high	Low
Production type	Stock production	Custom production
layout	Functional layout	Product layout

Example: traditional manufacturing works based on inventory. But lean manufacturing questions the role of inventory and defines as a waste it self and also as the reflector of the imperfections.

Principles of Lean Manufacturing:

Principle 1: Production of value

The value proposition is expressed as a product or service required at a specific price and time. Production to this specification is value creation. The fundamental priority is finding better ways to deliver value to the customer.

Principle 2: Optimizing the Value Stream

The goal is to identify the integral component processes necessary to value generation. Value stream mapping is the requisite tool here. The first map-A visual representation of the current state of production processes everywhere in the organization, from accounts payable to the shop floor, it can help all participants (management, engineers, production workers, schedulers, suppliers and customers) to recognize waste and identify its causes. This step-mapping the manufacturing value stream-marks the true beginning of the lean supply chain because it moves beyond the walls of the manufacturing company to include the supplier and customer.

Principle 3: Converting the Process to Flow

The flow principle underlies lean operations management. Once waste is removed, the goal is to transform all steps involved in making products (both within and outside of the organization) from lot-size production to flow; that is, continuous small-lot production.

Principle 4: Activating the Demand Pull

Demand pull means discontinuing the use of forecasts for planning and production execution. The ability to design, schedule, build and deliver to customer demand pulls product through the production process and supply chain.

Principle 5: Perfection of All Products, Processes and Services

When the first four principles are in place, companies are prepared to implement perfection of all processes, products and services.

Tools and Techniques Involved in Lean Manufacturing

1. Quality control Tools involved in lean manufacturing process:

- Pareto Chart:
- Fish Bone Diagram:
- Control charts

2. 5 S System:

These 5 Tools are utilized for Workplace Standardization

Seri (Sort):

Un-clutter the workspace, sort tools, equipment and work station layouts. Eliminate unnecessary items which take up space and reduce workflow.

Seiton (Straighten):

Make sure equipment and plant items are properly maintained, properly labeled and have clear operating procedures that operators can follow in day to day operation and for training purposes. It provides a positive and productive work environment.

Seiso (Set-in-order):

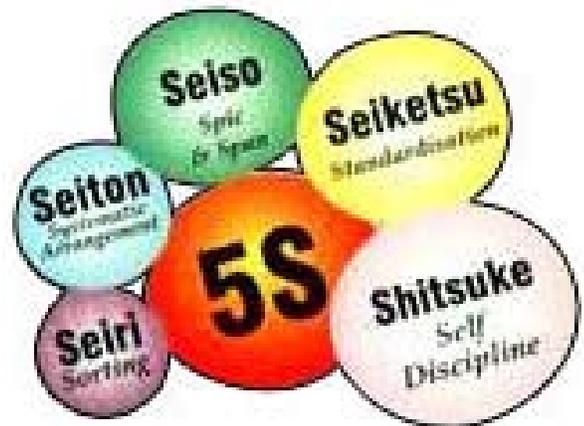
Make sure operators and staff have clear access to the required tools to complete their jobs. This can be achieved by clearly labeled shadow boards, tool/spares stores and offices where tools and equipment are stored, designated work areas defined, and a everything has a place, from chairs, to employee lunch boxes and work clothes.

Seiketsu (standardize):

Standard work procedures (refer to standard work definition) allow all operators to perform tasks or work activities in the same way every time. This process is usually commenced by having standard operating procedures for tasks performed regularly.

Shitsuke (Sustain):

Ensure these practices become part of the workplace culture, encourage a clean and un-cluttered workplace, where employees can perform their tasks efficiently and are proud



of their workplace. Inspect what you expect and specify that the standards above are as important.

3. Just in time (JIT):

This tool is one of the important tool for LEAN manufacturing .It defines the PULL Demand model instead of PUSH Demand model in earlier system which is mostly control the following activities

1. Purchase 2.Production 3.distribution.

4. KANBAN:

This is also another important LEAN Manufacturing Tool. Which will mainly focusing on over Production. There are mainly two types of Kanbans.

5. Kaizen:

Kaizen is the Japanese term for continuous improvement within a business, operations or productive process.

Some of the areas where kaizen activities and programs can be of great benefit include:

- Individual plant and machinery
- Entire production lines
- Raw material procurement and utilization
- Labour utilization
- Production processes and tasks

Approaches to Implement the Lean Production system in apparel industry

- **Develop the New ergonomics (Work cell)**

Work cell is normally smaller than usual working department, which contain 3 to 12 peoples and 5 to 15 work station are arrange which is usually U shaped layout .Generally this U shaped layout is organized around the product which in turn minimize the WIP in to 1 .This Cell can be replaced by normal assembly line system which contains 60 to 70 machine for making particular product .As ideal work cell is set up to produce narrow range of similar product accordingly all the necessary equipments and resources are arranged.

- **Cultivation of TEAM Work:**

All these days apparel productions were done through Progressive bundling System (Assembly line), which never given opportunity for the operator to work like TEAM. But this modular U shaped Production system has designed to make operator as One TEAM which helps them to trouble shoot the bottleneck operation, Quality improvement, higher productivity.

- **Rapid production setup:**

Now a days Customers are expecting to high quality garments at low price range moreover quantity of each style is very less(<500 pcs) and customer is also expecting to complete the production within 2 to 3days time, for achieving this target modular production system (U shaped layout)with the application of lean is very useful. Since the Lead time is very less we cannot go for Progressive bundling system because the Line setting time itself takes 1 to 2 days .where as Modular system can be rapidly developed (with in 1 hour time) execute the production in time.

6. Overall equipment effectiveness

OEE (Overall Equipment Effectiveness) is the process tool which helps to observe availability, performance and quality together to get a clear idea about how well the machine is being used. It gives the systematic steps for overall improvement.

- **Availability**

$$\text{Availability} = \frac{\text{Total available time}}{\text{Total planned Production time}}$$

Total available time= total planned production time-(time consumed/wasted in unplanned/sudden breakdowns and startup losses)

Total planned production time= total operating time-(time allotted for planned breaks and machine breakdowns for scheduled maintenance)

- **Performance**

$$\text{Performance} = \frac{\text{Total Minute Produced}}{\text{Total available (operating) time}}$$

Total minutes produced=number of goods produced*SAM value for one operation.

- **Quality**

$$\text{Quality} = \frac{\text{Time taken to produce acceptable quality products}}{\text{Total minutes produced}}$$

Time taken to produce acceptable quality products=total minutes produced –(time consumed in rework + time wasted in producing rejects)

$$\text{OEE} = \text{AVAILABILITY} * \text{PERFORMANCE} * \text{QUALITY}$$

Benefits of OEE:

- Monitoring and controlling of sudden machine breakdowns
- Analysis and improvement in set-up time for machines/equipments
- Machines/equipments idleness due to unavailability of material as a result of poor line balancing or wrong planning,
- Highlighting poor machine conditions,
- Highlighting operators inefficiencies with the key problems,
- Further training can be planned accordingly,
- Improved work place design by highlighting issues with man-machine and material
- Placement.
- Highlighting quality-related issues from particular machine/equipment or process.

Conclusion

Lean manufacturing initiative focus on cost reduction and increase in turnover by systematically and continuously eliminating non value added activities. In today's competitive market lean manufacturing is turning out to be .The solution to manufacturing industries across the spectrum for survival and success. Lean manufacturing helps organizations to achieve targeted productivity and more by introduction of easy of apply and maintainable techniques and tools. Its focus on waste reduction and elimination will soon be part of organization culture and turn every process into a profit center. Thousands of companies worldwide have achieved tremendous productivity and return on investments by implementing lean manufacturing practices

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and techniques. Indian industry has also witnessed many success stories in automotive, process and other industries.

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