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Overview of Lean Manufacturing and Its Implementation Techniques

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Abstract— Applying Lean manufacturing philosophy is one of the most important concepts that help enterprises to gain competitive advantage in the world market. Lean manufacturing or lean manufacturing is a manufacturing practice that emphasizes on the use of resources for work which add value for the end customer. The purpose of this paper is to give an overview of the lean principles, tools and benefits of lean concepts in manufacturing industries. Lean manufacturing is plethora of principles that focus on cost reduction by identifying and eliminating non value added activities. The fiercely globalized and competitive markets of 21st century demand for increasing high variety of products at lowest possible costs, lesser lead time and high quality. This changing market scenario calls for a new manufacturing that will enable us to compete in this global competitive market. This research addresses the application of lean manufacturing concepts to the continuous production/process sector with a focus on the manufacturing industry.

Keywords— Lean manufacturing, Waste 5S, Continuous Flow, Just-In-Time and Kaizen.

1. INTRODUCTION

Lean manufacturing is a method of achieving continuous improvements in performance through elimination of waste. In this process anything which doesn't add value is termed as waste .The term value is spoken with respect to end consumer or customer [1, 2]. That means any process or product for which customer is ready to pay or spend. Lean manufacturing was mainly developed in japan after 2nd world war, the concept was developed to utilize the very limited resources available after the war and to make best out of it. The Lean mainly focuses on the reduction of seven waste. They are Transportation, Inventory, Motion, Waiting, Over-Processing, Over-production and Defects [3, 4].

Transportation: Each and every time when a product is moved from one place to other there is a possibility of being damaged, lost, delayed etc. And transportation doesn't add any change or transformation to the product for which consumer is ready to pay for.

Inventory: Inventory may be in the form of stored materials, finished goods, work in progress or any investment which has not produced the output (or income) to the producer or the customer. Any of these items which are not actively processed adds value to the waste.

Motions: Motion refers to the movement of people or worker who produce the products, machines which help in processing of the product etc. Anything that causes repetitive strains, injuries to workers, wear and tear of machines accidents etc.

Waiting: Whenever the goods, raw materials are not processing, waiting for instructions, machine not idle (work in progress) or any resources waiting for the next process. Waiting increases capital investments requires additional handling and care.

Overprocessing: Overprocessing in terms of lean manufacturing is processing of product than actually required by the customers. Poor process design can lead to over processing. Over processing increases the cost of the product unnecessarily

Overproduction: Producing more no of products than the requirement is termed as over production, over production will add to all other problems like excess inventory, transport etc. And overall cost will also increases adding to this effect.

Defects: Whenever defects occur due to human error, caused by machine error or caused due to any other factor it will lead to either rework or scrap which intern increases work in progress, cost and time will also be increased and at end it will increases the cost of overall production.

2. METHOD USED TO IMPLEMENT LEAN MANUFACTURING AND REDUCING OF WASTE:

5S: Organizing the work space using concept of 5S

- Sort (Sorting the work space and eliminating that which is not needed)
- Set In Order (Reorganize the remaining items)
- Shine (Continuous cleaning and inspection of work area)
- Standardize (Preparing standards for above and following according to standards)
- Sustain (Maintaining the standards without deviation)

Andon: Visual feedback system for the plant space that provides production status, by giving alerts when there is a need for assistance and enables the workers to stop the production process. Which will form a real-time communication tool for the plant space that brings immediate attention to problems as whenever they occur – so that they can be immediately solved.

Bottleneck Analysis: Identifying which unit or part of the production process is limiting or reducing the overall throughput and enhancing the performance of that part of the process. By improving throughput we will be enhancing the strength of weakest link in the production process

Continuous Flow: Production Process in which work-in-process flows smoothly through production with minimum (or no) buffers between production steps of the production process. By doing this most of the wastes gets eliminated like waiting, inventory, transport etc.

The Real Work Place: A logic that helps us to get out of our workspace and invest time on the plant floor – the spot where real activity happens. This will advance a profound and exhaustive comprehension of certifiable assembling issues – by direct perception and by conversing with plant floor workers

Level Scheduling: A type of production scheduling that intentionally manufactures in very small batches by sequencing (blending) item variations inside the same process. This will reduce lead times (subsequent to every item or variation is made all the more as often as possible) and inventory (following batches are smaller).

Policy Deployment: making the strategy for the achieving goals with actively involving middle management and the work to be done on production floor. This guarantees that progress towards achieving strategic goals is consistent and thorough – this will eliminate the waste that arises from poor communication and inconsistent direction.

Automation: Outline hardware to partially automate the manufacturing process (partial computerization is normally a great deal less costly than full mechanization) and to naturally stop when defects are identified. Workers can as often as possible screen multiple stations (lessening work costs) and numerous quality issues can be identified instantly (enhancing quality).

Just-In-Time (JIT): Pull parts through manufacturing based on customer requirement instead of pushing parts through production based on projected demand. Relies on many lean tools, such as Continuous Flow, Kanban, Standardized Work and Time. Highly effective in reducing inventory levels. Improves cash flow and reduces space requirements.

Kaizen (Continuous Improvement): A method where representatives cooperate proactively to accomplish normal, incremental changes in the assembling procedure. Joins the aggregate talents of a company to create an engine for constantly disposing of waste from manufacturing processes.

Kanban (Pull System): A technique for managing the flow of goods both within the industrial facility and with outside suppliers and customers. In view of automatic recharging through signal cards that demonstrate when more goods are required. Disposes of waste

from inventory and overproduction. Can dispose of the requirement for physical inventories (rather depending on sign cards to demonstrate when more goods should be requested).

KPI (Key Performance Indicator): Measurements intended to track and empower progress towards critical goals of the organization. Emphatically advanced KPIs can be amazingly intense drivers of conduct – so it is critical to precisely choose KPIs that will drive desired behaviour. The best manufacturing KPIs: Are adjusted to top-level key objectives (in this way serving to achieve those objectives) are compelling at uncovering and measuring waste (OEE is a decent case) are promptly affected by plant floor representatives (so they can drive results)

Poka-Yoke (Error Proofing): Outline error detection and prevention into generation forms with the objective of accomplishing zero defects. It is troublesome to discover all defects through inspection, and correcting defects commonly gets essentially more expensive at every phase of production

Root Cause Analysis: A problem solving methodology that focuses on resolving the underlying problem instead of applying quick fixes that only treat immediate symptoms of the problem. A common approach is to ask why five times – each time moving a step closer to discovering the true underlying problem. Helps to ensure that a problem is truly eliminated by applying corrective action to the "root cause" of the problem.

Value Stream Mapping: A tool used to visually map the flow of production. Shows the current and future state of processes in a way that highlights opportunities for improvement. Exposes waste in the current processes and provides a roadmap for improvement through the future state.

Visual Factory: Visual indicators, displays and controls used throughout manufacturing plants to improve communication of information. Makes the state and condition of manufacturing processes easily accessible and very clear – to everyone.

SMART Goals: Goals that are: Specific, Measurable, Attainable, Relevant, and Time-Specific. Helps to ensure that goals are effective.

Standardized Work: Documented procedures for manufacturing that capture best practices (including the time to complete each task). Must be "living" documentation that is easy to change. Eliminates waste by consistently applying best practices. Forms a baseline for future improvement activities.

3. CONCLUSION

Lean manufacturing is one of these initiatives that focus on cost reduction by identifying and eliminating on value added activities .In Indian industry a lot of scope is their to improve inventory control, reduce lead time, set-up timer which will lead to competitiveness of Indian industry. Lean Manufacturing implementation is a multiplex process, a set of actions that requires planning the change and the establishment of positive environment, preparation, implementing various tools and techniques, and measuring the achieved progress using specific performance metrics. By implementing Lean manufacturing techniques the demand for increasing high variety of products at lowest possible costs, lesser lead time and high quality can be achieved.

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