Quality Management
Lean Tools and Techniques

Lean Tools and Techniques

- Lean Enterprises seek to eliminate seven sources of waste:
  - Overproduction
  - Idle time waste (waiting time/queue time)
  - Delivery waste (transport/conveyance waste)
  - Waste in the work itself
  - Inventory waste
  - Wasted operator motions
  - Waste of rejected parts

Lean Tools and Techniques

- Lean thinking generates process improvement by following five key steps:
  - 1. Study the process by directly observing the work activities, their connections and flow.
  - 2. Study the process to systematically eliminate wasteful activities, their connections and flow.
  - 3. Establish agreement among those affected by the process in terms of what the process needs to accomplish and how the process will accomplish it.
  - 4. Attack and solve problems using a systematic method.
  - 5. Integrate the above approach throughout the organization

Lean Tools and Techniques

- Lean tools include:
  - Kaizen
  - Value stream process mapping
  - 5 S
  - Kanban
  - Error proofing
  - Preventive and predictive maintenance
  - Setup time reduction
  - Reduced lot sizes
  - Line-balancing
  - Schedule leveling
  - Standardized work
  - Visual Management

Lean Tools and Techniques

- Kaizen
  - Guiding words
    - Combine
    - Simplify
    - Eliminate
  - Kaizen seeks to standardize work processes while eliminating waste.

Lean Tools and Techniques

- Value Stream Process Mapping
  - Value streams are the actions required to create a product or service from raw material until it reaches the customer.
    - A value stream may include both value and non-value added activities.
  - Value stream process maps seek to capture the activities taking place while people do the work they do.
  - Value stream process maps will show where improvements can be made to eliminate non-value added activities.

Lean Tools and Techniques

- Five S
  - Seiri　　　　Separate
  - Seiton　　　Arrangement
  - Seiso　　　　Cleanliness
  - Seiketsu　　Repeat seiri, seiton, and seiso at regular intervals
  - Shitsuki　　Discipline

Lean Tools and Techniques

- Kanban (Pull Inventory Management)
  - Kanban improves process management by focusing on visual control of the process.
  - Kanban cards tell the worker what must be produced as well as what has been produced.
  - Workers can not do more than the Kanban cards tell them to.

Lean Tools and Techniques

- Error Proofing (Poka-yoke)
  - Error proofing has five principles:
    - Elimination
    - Replacement
    - Facilitation
    - Detection
    - Mitigation
  - Error proofing seeks to improve a worker's ability to do their job by improving how they do their work.

Lean Tools and Techniques

- Preventive and Predictive Maintenance
  - Preventive maintenance maintains the equipment in good condition so that unexpected downtime does not occur.
  - Predictive maintenance schedules routine maintenance so that everyone knows and can plan for a machine or a piece of equipment being unavailable.

Lean Tools and Techniques

- Setup time Reduction
  - Setup time is the time between the production of the last good part in one series of parts and the production of the first good part in the next series of parts.
  - Setup time reduction efforts find ways to eliminate waste in setups thus speeding up the process of setup.

Lean Tools and Techniques

- Reduce Batch Sizes (Single Piece Flow)
  - Reduced batch sizes allow each piece as it is created to flow from one operation to the next with no delays, storages, or work-in-process inventories.
  - Reduced batch sizes increase inventory turn-overs and help show where process improvements can be made.
  - Reduced batch sizes allow quality issues to be found quickly.

Lean Tools and Techniques

- Line Balancing
  - Line balancing occurs when work is performed by each operator evenly over time with no peaks or valleys.
  - Each worker or machine on the assembly line has work that fills the same amount of time, so no one or no machine is waiting for something to do or is having to rush to keep up.

Lean Tools and Techniques

- Takt time refers to how often a single part should be produced in order to meet customer demand.

$$\text{Takt time} = \frac{\text{Available working time per day}}{\text{Customer demand rate per day}}$$

Lean Tools and Techniques

- Schedule Leveling
  - Establishing a schedule which allows the same amount to be produced daily with minimal fluctuations in demand.
  - Level scheduling enables an organization to link the customer schedule with the pace of manufacturing.
    - Requires the cooperation of the customer

Lean Tools and Techniques

- **Standardized Work**
  - Standard operating procedures
    - Everyone doing a particular job in the same way, no difference between the 10th time they did the work and the 4000th time they did the same work.

Lean Tools and Techniques

- Visual Management
  - Visual management enables someone looking at a job or a work space and know in at a glance that something has been misplaced or mismanaged.
  - Visual management encourages a place for everything and everything in its place.