

# Lean Manufacturing Course Outline

## UNIT 1 LEAN CONCEPTS

### Lesson 1 | Why Lean?

- Be customer focused: Be on-time, responsive, flexible, and fast.
- Simplify and standardize workflows: Mimic continuous flow, minimize WIP, use visible measures.
- Manage capacity: Increase process uptime, reduce set-up times, find "lost" capacity.
- Eliminate waste: Identify non-value adding activities, then modify, combine, or eliminate those tasks.
- JiT: Not too early and never late; not just-in-case inventory but just-in-time production and delivery; products must always be made right the first time; equipment must always work when needed.

### Lesson 2 | Lean Terminology

- Terms
- Tools
- Techniques

### Lesson 3 | Eliminate Waste

- Match lot sizes to customer demands: Use kanbans; end WIP.
- Use pull scheduling instead of push scheduling.
- Schedule to the rate-determining step (the bottleneck), then de-bottleneck process lines.
- Facilitate fast feedback: Arrange sequential operations next to each other to ensure fast feedback from internal customer operations to internal supplier operations if something in-process is not right.

### Lesson 4 | Components of Lean

- Overview of the 8 Components of Lean: Value Stream Mapping, Workplace Organization, Predictability and Consistency, Set-up Reduction, TPM, Visual Factory, Support Processes, and Continuous Improvement.

### Lesson 5 | Value Stream Analysis

- Map the process from incoming order to outgoing product: Define process goals, create the current state map, and establish process metrics.
- Use the current state map to identify potential improvements, conceive the future state.

### Lesson 6 | The Lean Mindset

- Eliminating waste is not limited to manufacturing; the same techniques apply to the office, sales, finance, maintenance, and even RandD processes and procedures.
- Lean and Six Sigma are complementary.

### Unit 1 Challenge

- An assessment of the learner's progress in this unit.

## UNIT 2 LEAN PRACTICES

### Lesson 1 | Streamlining the Value Stream

- Identify process goals.
- Collect and analyze process data.
- Create a macro-facility workflow to determine how to minimize high volume travel distances.
- Conduct a micro-process workflow to apply cellular concepts, identify and remove bottlenecks, and move to pull manufacturing with kanbans.

## Lesson 2 | Workplace Organization

- Apply the 5Ss: Sort (clearing the work area), Set in Order (designating locations), Shine (cleanliness and workplace appearance), Standardize (everyone doing things the same way), and Sustain (ingraining it in the culture).

## Lesson 3 | Predictability and Consistency

- Use DFA/DFM to design quality in.
- Conduct GRandRs to ensure reliable measurement systems are in place.
- Employ SPC to help ensure processes are predictable and stable.
- Reduce variation and improve process capability with DOE.
- Eliminate the root cause of defects using problem-solving and mistake-proofing.
- Move to Six Sigma quality.

## Lesson 4 | Set-Up Reduction

- Apply SMED concepts.
- Separate external tasks (external to the process) from internal tasks.

## Lesson 5 | TPM

- TPM versus PM
- Develop operator involvement in the equipment and begin predictive maintenance practices.

## Lesson 6 | Visual Workplace

- Visual Workplace
- Use status display of performance for dashboard or balanced measures and COQ results.
- Visual controls, such as sensory alerts, indicate if something is out of place.
- Marking on the floor, kanbans, andons, and panel-alarms all help build a visual control infrastructure.

## Lesson 7 | Support Processes

- Lean techniques require changes in Purchasing, Scheduling, Warehousing/Shipping, and Accounting practices.

## Lesson 8 | Continuous Improvement

- Fight NIH (not-invented-here) attitudes and leverage successes.
- Use kaizen events for rapid, targeted improvements to achieve the future state.
- Use a standardized Problem-Solving Model (e.g. DMAIC or 8D).
- Begin an employee idea system.

## Unit 2 Challenge

- An assessment of the learner's progress in this unit.

# UNIT 3 IMPLEMENTING LEAN

## Lesson 1 | Lean Starts with People

- Lean Starts with People
- Communicate the why, what, how, and who.
- Provide education in the concepts.
- Train employees in tools and techniques as needed to achieve a flexible workforce.

## Lesson 2 | Data Drives Lean

- Focus efforts on projects that lead to tangible savings.

- Calculation techniques to generate data include: Time studies, equipment loading, TAKT time, staffing requirements, process yields, and COQ.
- Sample Worksheets covered include: Lean Project Summary; Cell Target Worksheet; Data Collection Form for Basic Equipment and Utility Parameters; Value-Adding Analysis Worksheet; Process Change-Over/Setup Worksheet; Set-Up Reduction Worksheet; and Lot Size Worksheet.

### Lesson 3 | Layout Options

- Improved layouts are about moving cubic feet (not numbers of items), eliminating crossover points, arranging the process in the natural flow order; linking processes to minimize time and distance; moving equipment together to simulate a continuous process flow; and putting internal customers and suppliers next to each other.
- Be careful to identify anchors or monuments; do not move them.
- Typical layout options are explored.

### Lesson 4 | Lean Inventory Practices

- Minimize trips to and from the warehouse by designing the warehouse to work for you.
- Use ABC inventory categories to prioritize inventory needs and storage locations.

### Lesson 5 | Roadmap for Lean

- Start with the people issues.
- Focus on workplace organization (the 5S's), then, use value stream analysis and process workflow analysis to establish effective layouts.
- Where to focus next depends on specific needs.
- Use targeted Kaizen events to speed changes.
- Do not overlook the need to modify support processes (especially scheduling and purchasing).

### Lesson 6 | Lean Pitfalls

- Not documenting the financial impact/savings.
- Lack of commitment from leadership.
- Using traditional purchasing practices.
- Not changing scheduling techniques.
- Failure to address workforce issues.
- Not mistake-proofing the root cause.
- Thinking Lean is just for manufacturing.
- Not using beneficial technology.
- Not leveraging successes.
- Getting too lean.
- Failure to hold the gains.

### Unit 3 Challenge

- An assessment of the learner's progress in this unit.