



NECA
2013
WASHINGTON

Introduction to Lean Construction for the Electrical Contractor

October 13, 2013 – 9:00 AM – 9:50 AM

Following this session, you will be able to:

- Discuss the concepts related to lean construction
- Identify the steps required to move their company culture toward one which supports lean
- Describe the next steps required in implementing lean
- Discuss some of the lean tools available to support this change

Continuing Education Credits

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This session is eligible for 0.1 IACET CEU

To earn these credits you must:

- Have your badge scanned at the door
- Attend 90% of this presentation
- Fill out the online evaluation for this session

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Overview of Lean

- **Mark Federle**
- **Professor and McShane Chair in Construction Engineering and Management**



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Historic Roots for Lean

- From the Toyota Production System
 - The Two Pillars are:
 - Respect for People
 - Continuous Improvement
- The Toyota Way – Jeffrey Liker

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Defining Lean

“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.”

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Essential Features of Lean Construction

- Project is structured and managed as a value-generating process
- Downstream stakeholders are involved in front-end planning and design
- Focus is on making workflow reliable instead of improving productivity
- Personnel focus on the flow of materials and information throughout the process

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Essential Features (Cont'd)

- Capacity and inventory buffers are used to absorb variability
- Feedback loops are incorporated at every level, dedicated to improvement

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Lean Construction

- Building and construction are designed together
- Work is structured to maximize value and reduce waste
- Focus is on managing and improving overall project performance
- Project control focuses on making things happen

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Goals of Lean

- The focus is improving productivity through:
 - Constantly simplifying processes
 - Encouraging input and collaboration
 - Decreasing waste (materials, manpower, re-work, JIT - just in time, promote safety)
 - Increasing efficiency (more shop fabrication, level crew sizes)
 - Creating predictable work flow
 - Reducing material and tool inventory

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What should the Owner pay for?

Value Added

That is the definition of value – too much hidden costs currently exist in our waste

Any activity that increases the market form or function of the product or service.

Non-Value Added

Any activity that does not add market form or function or is not necessary. (These activities should be eliminated, simplified, reduced, or integrated.)

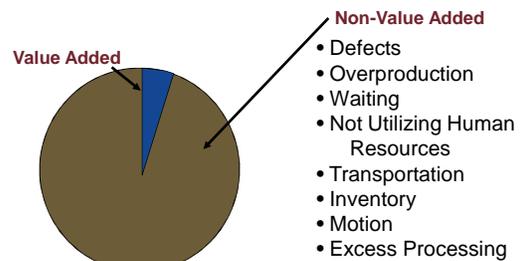
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The Four Components of Lean

- Lean Planning
 - Tie Organizational Goals with Lean Tools
- Lean Concepts
 - Eliminate Waste
 - Increase Planning Reliability
 - Measure before decision making
- Use Lean Tools
- Develop a Lean Culture

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Identifying Wastes



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Overproduction

- Making more than is required by the next process
- Making it earlier than is required by the next process
- Making it faster than is required by the next process
- A few causes of overproduction
 - Just-in-case logic
 - Unlevel scheduling
 - Unbalanced workload
 - Need for more data, “Fear of making a mistake”

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Inventory Waste

- Any supply in excess of a one-piece flow through your work process
- A few causes of excess inventory
 - Misconception that this protects the company from inefficiencies and unexpected problems
 - Misunderstood communications
 - Reward system
 - Unreliable shipments by suppliers

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Defects

- Inspection and repair of material in inventory
- Causes of defects
 - Poor quality control
 - Poor process control
 - Inadequate education/training/work instructions
 - Incomplete design
 - Customer needs not understood
 - Punch list/rework

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Processing Waste

- Effort that adds no value to the product or service from the customers' viewpoint
- Causes of processing waste
 - Just-in-case logic
 - Lack of communication
 - Redundant approvals
 - Extra copies/excessive information

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Waiting Waste

- Work waiting on workers or workers waiting on work
- Idle time created when waiting for...?
- Causes of waiting waste
 - Unbalanced work load
 - Unplanned maintenance
 - Long process setup times
 - Upstream quality problems
 - Unlevel scheduling

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Motion Waste

- Any movement of people or machines that does not add value to the product or service
- Causes of motion waste
 - Poor people/equipment effectiveness
 - Inconsistent work methods
 - Unfavorable jobsite layout
 - Poor laydown / work area organization and housekeeping
 - Extra "busy" movements while waiting

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Waste of Transportation

- Transporting parts and materials around the project
- Causes of transportation waste
 - Poor office, shop, or jobsite layout
 - Poor understanding of the process flow for production
 - Large batch sizes, long lead times, and large storage areas

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People Waste = Underutilized People

- The waste of not using people's mental, creative, and physical abilities
- Causes of people waste
 - The culture
 - Poor hiring practices
 - Low or no investment in training
 - High turn-over

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Lean Construction Tools

- Core Tools
 - Waste Removal
 - 5 S's
 - Use of Teams
 - Standardized Processes
 - Value Stream Mapping
 - A3 Problem Solving
 - Last Planner
- Construction Tools
 - Integrated Project Delivery (IPD) using an Integrated Form of Agreement (IFOA)
 - Virtual Design and Construction (VDC)
 - Target Value Design
 - Choosing by Advantages

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Lean Tools - 5S Process

5S Description

1. Separate / Scrap
2. Straighten
3. Scrub
4. Systematize
5. Sustain / Standardize

5S Example

1. Separate like materials
2. Organize tools / Equipment
3. Keep work area clean
4. Communicate expectations
5. Develop / measure standards

For an example – see www.grunau.com and watch their video

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Lean Construction Tools

- Daily Huddles (use of Teams)
 - What are production goals for Today?
 - What do we need (TIMMES) to make that happen?
 - What obstacles (constraints) may prevent us from achieving the goal?
 - Is there a better way to do this?
 - What Safety Hazards exist for this activity?
 - Were there any near misses yesterday?

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Lean Construction Tools

- TIMMESS
 - Before starting an activity does the crew have all the needed:
 - Tools
 - Information
 - Manpower
 - Materials
 - Equipment
 - Space
 - And has Safety been considered

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Lean Tool – Using A3's*

| <p>1) Identify the Problem or Need</p> <p>2) Understanding the Current Situation/State</p> <p>3) Goal Statement – Develop the Target State <small>(Goal meet the business goals deployed in Policy Deployment)</small></p> <p>4) Root Cause Analysis (see also back side of this form)</p> | <div style="text-align: center;"> A3 Problem Solving <small>Problem Solving Tools on Black Side</small> </div> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 5px;"> <tr> <td style="width: 30%;"><small>Process</small></td> <td style="width: 30%;"><small>Contract</small></td> <td style="width: 30%;"><small>Date</small></td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table> <p>5) Brainstorm/Determine Countermeasures</p> <p>6) Countermeasures Implementation Plan</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 5px;"> <thead> <tr> <th style="width: 60%;">Action Item to be Completed</th> <th style="width: 10%;">Who</th> <th style="width: 10%;">When</th> <th style="width: 20%;">Status</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td style="text-align: center;">⊕</td></tr> </tbody> </table> <p>7) Check Results – Confirmation of Effect</p> <p>8) Update Standard Work</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 5px;"> <thead> <tr> <th style="width: 30%;">What</th> <th style="width: 30%;">Accountable</th> <th style="width: 40%;">When</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> </tbody> </table> | <small>Process</small> | <small>Contract</small> | <small>Date</small> | | | | Action Item to be Completed | Who | When | Status | | | | ⊕ | | | | ⊕ | | | | ⊕ | | | | ⊕ | What | Accountable | When | | | | | | |
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*Courtesy of Larry Rubrich

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Cycle Time

“One of the most noteworthy accomplishments in keeping the price of Ford products low is the gradual shortening of the production cycle. The longer an article is in the process of manufacture and the more it is moved about, the greater is its ultimate cost.”

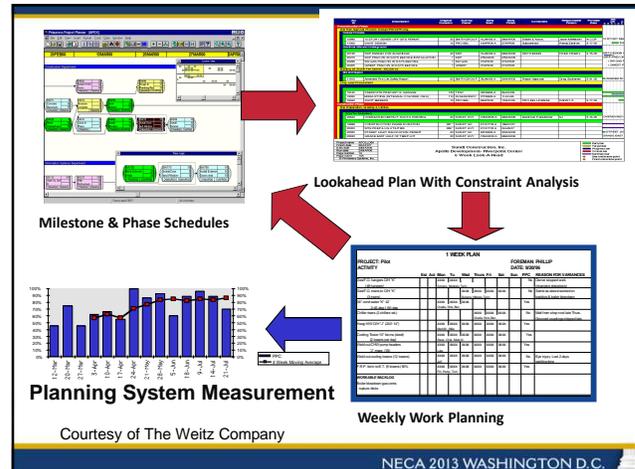
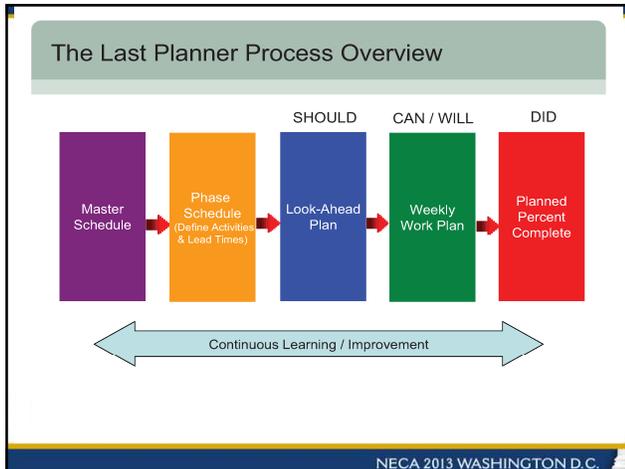
Henry Ford, 1926

A key focus of Lean is reducing Cycle Time!

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- ## Predictable Work Flow
- Based on Reliable Promises
 1. Am I able to perform the task and have the resources to do it?
 2. Do I understand how much time it will take me to perform the task?
 3. Have I blocked out time in my calendar that I need to perform the task?
 4. Am I freely and sincerely making this promise?
 5. Will I be responsible for any issues that would occur should I not be able to perform the task?
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- ## Last Planner System™
- Reliable promises can only be made by the last planners – the foremen
 - Use the Master Schedule (Should) to Develop the Weekly Work Plan (Can) and measure results – Percent Planned Complete (Did)
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- ### Creating the Lean Culture: Key Success Factors
- Prepare And Motivate People
 - Involve Employees At All Levels And Functions
 - Share Information And Manage Expectations
 - Create An Atmosphere Of Experimentation
 - Install "Enlightened" And Realistic Performance Measures
 - Execute Pilot Projects
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- ### Creating the Lean Culture: Implementation Success Factors
- Unyielding Leadership
 - Strategic Vision Based On Lean Enterprise as a part of Company Strategy
 - Observe Outside Successes and Failures
 - Ability To Question "EVERYTHING"
 - Deep Commitment To EXCELLENCE
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Thus driving contractors to Lean

- Additional Resources:
 - The Lean Construction Institute
 - www.leanconstruction.org
 - The Construction Industry Institute
 - www.construction-institute.org
 - The Lean Construction Forum
 - <http://agcleanforum.org/>

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Questions

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