Modern Continuous Improvement Methods to Improve Seaport Velocity and Productivity

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Thanks!
Where Did “Lean” Come From?

**The Toyota Production System** by Taiichi Ohno

**The Machine That Changed the World and Lean Thinking** by Jim Womack and Dan Jones
Lean Enterprise Objective

All we try to do is “reduce the timeline from the moment a customer places an order to the point the customer receives what they want (and the company collects cash) by removing non-value-added activities (or waste)” – Taiichi Ohno, The Toyota Production System
The need for efficient travel and transfer of goods between overseas ships and domestic trucks, trains, and barges has accelerated due to:

- Increase in world population
- Nations increasingly becoming more industrialized
- Heavier reliance on world trade
The Case for Port Improvement:

The Data:
- Foreign trade accounts for 22% of the U.S. Gross Domestic Product
- 95% of this trade is moved by ships (USDOT)

Trends:
- North American port volumes have increased by an average of 7% per year since 1990
- It is estimated that most major ports are already operating near capacity, and some reports are predicting port volumes to double by 2020
  (Transportation Journal)
Why Lean at Ports?

To increase port capacity without significant investment in new resources, we must:

- **Flow** material through at a faster rate
  - Unload more efficiently when it arrives
  - Manage material more efficiently while we store it
  - Load more efficiently when it departs
Why Lean at Ports?

**Past:** Price set by provider

\[ \text{Operating Cost} + \text{Profit} = \text{Price} \]

**Today:** Price set by market

\[ \text{Price} - \text{Operating Cost} = \text{Profit} \]

The key to truly reducing operating cost is to simplify processes by eliminating non-value-added steps (waste)!
“Learning to See”

Every process has wastes...the key lies in seeing it

VALUE ADDING ACTIVITY

Absolute minimum activities which must be done to produce customer requirements:

*Things that customers pay for*

NON-VALUE ADDING ACTIVITY

Any resources like labor, space, materials spent in the manufacturing process that customer has no requirements for:

*Things that customers do not pay for*

Typically 95% of **Total Lead Time** is Non-Value Added!
8 Deadly Wastes

• Defects
• Overproduction
• Waiting
• Not Utilizing People’s KSAs
• Transportation
• Inventory
• Motion
• Excess Processing
Waste of Defects
Waste of Defects
Waste of Overproduction
Waste of Overproduction
Waste of Waiting
Waste of Waiting
Waste of Waiting
Waste of Not Using People’s KSAs
Waste of Transportation
Waste of Transportation
Waste of Transportation
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Waste of Inventory
Waste of Inventory
Waste of Motion
Waste of Motion
Waste of Motion
Waste of Excess Processing
Waste of Excess Processing
Waste of Excess Processing
UAH Lean Enterprise for Port Operations

Continuous Improvement Culture

Customer Focus (TAKT)

Kaizen

Teamwork

Workplace Analysis

Workplace Organization

Workplace Optimization

Value Stream Mapping

Quality @ The Source

TPM

Layout

SMED Principles

Standardized Work

5s System

POUS

Visual Workplace

Customer Focus (TAKT)

Teamwork

Kaizen

Continuous Improvement Culture
Workplace Organization

Tools

- **5S**— (Sort, Set-in-Order, Shine, Standardize, Sustain)
  - A safe, clean, neat, arrangement of the workplace provides a specific location for everything, and eliminates anything not required

- **Point-of-Use-Storage (POUS)**
  - Locate items necessary to perform job activities where they are used (Tools, materials, supplies, equipment, and information)

- **Visual Workplace**
  - Simple, self-explanatory signals that give immediate and accurate understanding of a situation or condition
Tools and Equipment at the Point of Use

Tools and equipment located exactly where needed
Materials and Supplies at the Point of Use
Information at Point of Use

Ship unloading status

Work Instructions
Visual Identification

Equipment Identification

Product Identification
Painted parking locations to ensure adequate space for loading

Outlined location with labeling
Visual Communication

Visual aids for crane controls

Visual communication board

Shift Communication Board

NEXT Tow Gulf Blend
4 IN Tow

 HIGH WIND
 BRAKE RELEASE
 RETURN POINT
 STORM PIN RELEASE
 MODE SELECTION
 LOAD SELECTION GRAB
 TROLLEY AND TRAVERSE
 WIND SCREEN
 GRAB LIMIT OPEN, OPER/ADJ. CLOSE
 BOOM PARKED, UP 70°, STOP
 LIGHT WARF ON/OFF
 LIGHT GIRDER
 LIGHT BOOM ON/OFF
Visual Workplace

Color-coding cargo by destination

Clearly marked yard locations
Truck Loading Procedures

1. When loading is complete do a load check verifying correct product was loaded, load is tight and can be transported safely, loaded in proper order to minimize customer movement. Note on Roll off trailers roll canopy front to back ensuring there are no obstructions interfering with canopy movement.

2. Raise Bridge
   - Turn Central Key to on Position
   - Press horn button for 5 to 10 seconds
   - Bridge raise, stop automatically and orange light signals bridge is fully raised

3. Lower Bridge
   - Turn Central Key to on Position
   - Press horn button for 5 to 10 seconds
   - Bridge lowers, stop automatically and white light signals bridge is fully lowered

4. Sign paperwork, turn in to office, and pick up next assignment.
Workplace Organization

Before

After
Workplace Organization

Before

After
Workplace Organization

Before

After
SMED Principles: Internal vs. External Steps

**Internal Steps:**
- Ship arrives
- Checked by Customs
- Open hatch doors
- Position Cranes
- Flop Gates & Start Conveyors
- Start Unloading

**External Steps:**
- Open hatch doors
- Position Cranes
- Flop Gates & Start Conveyors

**Time (Min):**
- 15
- 30
- 45
- 60
- 75
- 90

**External**

**Internal**
7. Visually inspect load for: items outside the rails of the trailer and square up as needed, blocking is in correct position and adequate to support the load, no loose items or wrappers, all units are tagged properly.

Bundles loaded outside the trailer rails have to be squared up.

Loose wrap has to be stapled down before loading.

Correct blocking.

Complete load check and sign-off paperwork.
Standardized Work

Load Profiles

12 - 4x8 Bundle Profiles

Side View

Top View

15 - 4x8 Bundle Profiles

Side View

Top View
8. Call loaders to send coal

- Note: Keep coal out of the bow corners
- Position chute to place coal in the center of the barge
- Begin placing coal between the 6th & 7th rib

9. Load coal until the bottom of the pile builds up to the weld line on the wall of the barge (Note: Keep coal out of the corners of the bow)

10. Once the first pile is the correct height move the barge north keeping the pile consistent height (Note: Monitor barge list and correct as needed by positioning chute in shore/out shore)

- Weld line on barge
- Load barge keeping a consistent pile height
Quality at the Source

- Training to improve quality

Visual training procedures

**Unloading Schedule**
(Standard 7 Hatch Vessel)

<table>
<thead>
<tr>
<th>Hatch 1</th>
<th>Hatch 2</th>
<th>Hatch 3</th>
<th>Hatch 4</th>
<th>Hatch 5</th>
<th>Hatch 6</th>
<th>Hatch 7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F Crane</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Start</strong></td>
<td>Hatch 2 dig 1/2 of hatch</td>
<td>Hatch 1 dig 1/2 of hatch</td>
<td>Hatch 3 dig 1/2 of hatch</td>
<td>Hatch 2 finish hatch</td>
<td>Hatch 4 finish hatch</td>
<td>Hatch 1 finish hatch</td>
</tr>
<tr>
<td><strong>H Crane</strong></td>
<td>Hatch 4 dig 1/2 of hatch</td>
<td>Hatch 6 dig 1/2 of hatch</td>
<td>Hatch 5 dig 1/2 of hatch</td>
<td>Hatch 7 dig 1/2 of hatch</td>
<td>Hatch 6 finish hatch</td>
<td>Hatch 7 finish hatch</td>
</tr>
</tbody>
</table>

**Mentoring Checklists**

**TRAINMAN CUB REPORT**

<table>
<thead>
<tr>
<th>PLEASE PRINT LEGIBLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAME and JOB #</td>
</tr>
<tr>
<td>CUB'S PAYROLL #</td>
</tr>
<tr>
<td>FOREMAN/TRAINMEN</td>
</tr>
</tbody>
</table>

**ACTUAL TIME SPENT**
(PERFORMING SWITCHING DUTIES)

**WORE SUITABLE CLOTHING, FOOTWEAR, P.P.E.'s**
Yes____ No____

**MOUNT/DISMOUNT LOCOMOTIVE EQUIPMENT PROPERLY**
Yes____ No____

**FOLLOWS PROPER RADIO PROCEDURES**
Yes____ No____

**DURING JOB BRIEFING WERE QUESTIONS ASKED? IF SO WHAT?**

**ASK'S FOR 3-STEP PROTECTION BEFORE GOING UNDER OR FOULING STANDING EQUIPMENT WITH LOCOMOTIVE ATTACHED.**
Yes____ No____

**FOLLOWS SAFETY RULES**
Yes____ No____

**PROPERLY POSITIONED HIM/HERSELF FOR TASK BEING PERFORMED.**
3. What is the measurement at the arrow?
   a. 2 1/2
   b. 2 5/8
   c. 2 3/4
   d. 2 11/16

4. If bar Y moves left at a constant speed, how does bar X move?
   a. Faster than Y
   b. Same speed as Y
   c. Slower than Y

5. Which container holds more
   a. Container A
   b. Container B
   c. Equal
Quality at the Source

- Improving process quality – (mistake-proofing)

Guides to simplify pick-up of containers
Improving process quality—(mistake-proofing)
TPM is a company wide equipment maintenance program that permanently improves the overall effectiveness of equipment with the active involvement of all employees.

Goal is to eliminate/minimize downtime due to breakdown maintenance and to maintain machines at peak performance.
Current State

Typical conditions:
- There is often a run-to-failure mentality
- Breakdowns occur regularly
- Temporary repairs are the norm
- Minor stoppages occur frequently
- Processing speed decreases
- No one is accountable for tracking these losses
- Operator training may not be adequate
What’s the Impact?

- An estimated $200 billion spent each year on wasteful maintenance-related activities.
- Average equipment efficiency < 50%
Kaizen and Lean

Kaizen is the vehicle of implementation for Lean tools.
Kaizen is the process of:
- Identifying & eliminating waste
- as quickly as possible
- at the lowest possible cost

Kaizen requires:
- Continuous, gradual, persistent improvement
- by all employees and management

Kaizen utilizes:
- Cross functional team
- Focused scope
- Aggressive goal
Teamwork

T - Together

E - Everyone

A - Achieves

M - More
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Value Stream Mapping
Value Stream Mapping

- Determining the product families
- Understanding how the shop floor currently operates. (Foundation for future state.)
- Designing a lean flow & how to get there.
- Do IT!
Future State Import VSM

**Bulk Operation Division**

**Importing Suppliers**
- **Berth**
  - **Ship**
    - **1 Every 3 Days**
    - **10 / Month**
    - **Average 75k Tons**
  - **CT = 1 - 2 hrs**
  - **Ties up**
  - **Customs**
  - **Imigration**
  - **Agriculture**
  - **Unloads 30K Daily**

**Crane**
- **CT = 2.5 days**
- **Rel = 95%**
- **Boom Down and dig**
- **4 x 3 shifts**

**Stacker**
- **CT = 2.5 days**
- **Rel = 90-95%**
- **Locate to correct pile**
- **If bi-wing stacker used then dozer needed**
- **1x3 shifts**

**Stock Pile**
- **CT = Continuous**
- **Dozers pushing to pile**
- **Contamination**
- **Dust control**
- **4 + x 2 shifts**

**Stacker/Reclaimer**
- **CT = 60 min per barge**
- **C/O = 15-20 min**
- **X 3 per day**
- **Rel = 90-95%**
- **Locate pile**
- **-1500 tons/hr**
- **1 x 3 shifts**

**Barge Loading**
- **CT = 60 min**
- **Rel = 95%**
- **Hook up Barge**
- **-Start conveyor**
- **-Defects are overloading and unlevel load**
- **-Survey adds 20 min**
- **-25% loaded at front dock**
- **3 x 3 shifts**

**Surveyor**
- **18 / Day - 28 Max**
- **Avg. 1500 Tons per Barge**

**Customer**
- **Southern Co. Ala Ele Coop**

**Evaluation**
- **Stockpile allocation**
- **Modify/Expand/Upgrade Conveyor system**
- **Develop better understanding with customers**
- **Add barge loading station**
- **Add dock & crane to unload ships**
- **Implement new maintenance program**

**Process Time**
- **182 min/Barge**

**Lead Time**
- **360 Barges**
Value Stream and Supporting Processes

Operational Value Streams

- Hiring & Payroll
- Engineering
- Order Entry
- Purchasing
- A/R
- A/P

What the customers want when they want it

Support Processes - These processes only create value for internal customers, but are currently necessary to run the business
Executive Management Involvement
- Integrate Lean Enterprise into strategic planning
- Invest in Lean Enterprise training at all levels of the organization
- Establish Lean Steering Committee
- Choose a pilot area and get started!

Value Stream Management
- Coal Terminal Future State Import VSM
- Bulk Operation Division
- Process Time 182 min/Barge
- Lead Time 360 Barges

UAH Lean Enterprise Model for Seaport Operations
- Kaizen Teamwork
- Customer Focus (TAKT)
- Quality @ The Source
- TPM
- Layout
- SMED Principles
- Standardized Work
- Se System
- POUS
- Visual Workplace
- Value Stream Mapping

Keys to Success
- Integrate Lean Enterprise into strategic planning
- Invest in Lean training at all levels of the organization
- Establish corporate Lean Steering Committee to champion efforts
- Establish appropriate performance metrics
- Practice Value Stream Management
Growth Strategy

- Satisfy the Customer
- Invest in Employees
- Grow the Company
- Sales
- Improvement
- Profit
Benefits of Lean at Ports

- Flexibility
- Documented Procedures
- Involved Workforce
- Visual Management

**Barge Loading**
- Improvement: 125%

**Barge Unloading**
- Improvement: 70%

**Train Car Dumping**
- Improvement: 100%

**Ship Loading**
- Improvement: 44%

**Ship Unloading**
- Improvement: 26%