Modern Continuous Improvement Methods to Improve Seaport Velocity and Productivity

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KAIZEN EVENTS & TRAINING
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

Satisfy the customer by...

1. Reduce Cost
2. Improve Quality
3. Compress Time
The Case for Port Improvement:

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 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)
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?
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
Waste of Inventory
Waste of Inventory
Waste of Inventory
Waste of Inventory
Waste of Motion
Waste of Motion
Waste of Motion
Waste of Motion
Waste of Excess Processing
Waste of Excess Processing
UAH Lean Enterprise for Port Operations

- Continuous Improvement Culture
- Teamwork
- Customer Focus (TAKT)

   - Kaizen
   - Quality @ The Source
   - TPM

   - Workplace Optimization
   - Layout
   - SMED Principles
   - Standardized Work

   - Workplace Analysis
   - 5s System
   - POUS
   - Visual Workplace

- Value Stream Mapping
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

Work Instructions

Ship unloading status
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
Visual Workplace

- Color-coding cargo by destination
- Clearly marked yard locations
**Visual Work Instructions**

**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 from front to back ensuring there are no obstructions interfering with canopy movement.

2. Sign paperwork, turn it in to office, and pick up next assignment.

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**Raise Bridge**

1. Turn Central Key to an Partition
2. Switch Emergency stop to run position
3. Switch Railway signals to stop
4. Switch Machine brake to release
5. Switch Span Locks to Pull position (allow 15 sec for lock to release)
6. Switch Span to operate to raise
7. Press horn button for 5 sec and
8. Press run button and release
9. Bridge raise stage automatically and orange lights signals bridge is fully raised
10. Once bridge is raised switch Span operate and press lock to neutral position
11. Switch machine brake to set
12. Switch Emergency stop to stop position
13. Switch central key to off

**Lower Bridge**

1. Turn Central Key to an Partition
2. Switch Emergency stop to run position
3. Switch Railway signals to stop
4. Switch machine brake to release
5. Switch Span Locks to Pull position (allow 15 sec for lock to release)
6. Switch Span to operate to lower position
7. Press horn button for 5 sec and
8. Press run button and release
9. Bridge lower stage automatically and white lights signals bridge is fully lowered
10. Switch on locks in the drive position (allow 15 sec for lock to engage)
11. Switch machine brake to set
12. Switch Emergency stop to stop position
13. Switch central key to off
Workplace Organization

Before

After
Workplace Organization

Before

After
SMED Principles: Internal vs. External Steps

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

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

- **Internal**
  - Ship arrives
  - Checked by Customs
  - Start Unloading

Time (Min) 15 30 45 60 75 90
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

Center Marker

Top View

15 - 4x8 Bundle Profiles

Side View

Center Marker

Top View
**Barge Loading SOP**

8. Call loaders to send coal

- **Note:** Keep coal out of the bow corners

- 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**
UAH Lean Enterprise for Port Operations

Continuous Improvement Culture

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Value Stream Mapping

Customer Focus (TAKT)

Teamwork

Kaizen
Training to improve quality

Visual training procedures

Unloading Schedule
(Standard 7 Hatch Vessel)

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

Mentoring Checklists

TRAINMAN CUB REPORT

PLEASE PRINT LEGIBLY
NAME and JOB #
CUB'S PAYROLL #
FOREMAN/TRAINMAN

ACTUAL TIME SPENT
(PERFORMING SWITCHING DUTIES)

 WORE SUITABLE CLOTHING, FOOTWEAR, P.P.E.S. Yes No
 MOUNT/DISMOUNT LOCOMOTIVE/EQUIPMENT PROPERLY.
  Yes No
FOLLOW 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
FOLLOW SAFTY 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
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.
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
An estimated $200 billion spent each year on wasteful maintenance-related activities.

Average equipment efficiency < 50%
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
UAH Lean Enterprise for Port Operations

Continuous Improvement Culture

Workplace Optimization

Workplace Analysis

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Visual Workplace

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!

Product Family

Current-State Drawing

FUTURE-STATE DRAWING

Implementation

REPEAT
Future State Import VSM

**Berth**
- **CT**: 1-2 hrs
- **Rel**: 95%
- **Ties up**
- **Customs**
- **Immigration**
- **Agriculture**
- **Stock Pile**
  - **CT**: Continuous
  - **C/O**: Dozers pushing to pile
  - **Rel**: Contamination
  - **Rel**: Dust control

**Crane**
- **CT**: 2.5 days
- **C/O**: 15 min
- **Rel**: 90-95%
- **Defects**: Overloading and unlevel load
- **Survey adds**: 20 min
- **Rel**: 25% loaded at front dock

**Stacker**
- **CT**: Continuous
- **C/O**: Dozers pushing to pile
- **Rel**: Contamination
- **Rel**: Dust control

**Stock Pile**
- **CT**: 60 min per barge
- **C/O**: 15-20 min
- **Rel**: 90-95%
- **Locate pile**: -1500 tons/hr

**Stacker/ Reclaimer**
- **CT**: 60 min per barge
- **C/O**: 15-20 min
- **Rel**: 90-95%
- **Locate pile**: -1500 tons/hr

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

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

**Process Time**
- 182 min/Barge

**Lead Time**
- 360 Barges

**Implement new maintenance program**

**Add dock & crane to unload ships**

**Monthly Coal Flow meeting**
- Emails Vessel Scheduler
- Tonnage, Customer, Destination

**Shipping Notice**

**Evaluate stockpile allocation**

**Modify/Expand/Upgrade Conveyor system**

**Add barge loading station**

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

**Survey**

**Add railcar load out**

**Supervisor Meeting Schedule**
- Barry orders
- Auto sample

**Sample Test**
- Barry orders
- Auto sample

**Control Tower**

**Surveyor**
- 18 / Day - 28 Max
- Avg. 1500 Tons
Value Stream and Supporting Processes

Operational Value Streams

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
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

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!
Benefits of Lean at Ports

- Flexibility
- Documented Procedures
- Involved Workforce
- Visual Management

**Barge Loading**
125% improvement

**Barge Unloading**
70% improvement

**Train Car Dumping**
100% improvement

**Ship Loading**
44% improvement

**Ship Unloading**
26% improvement