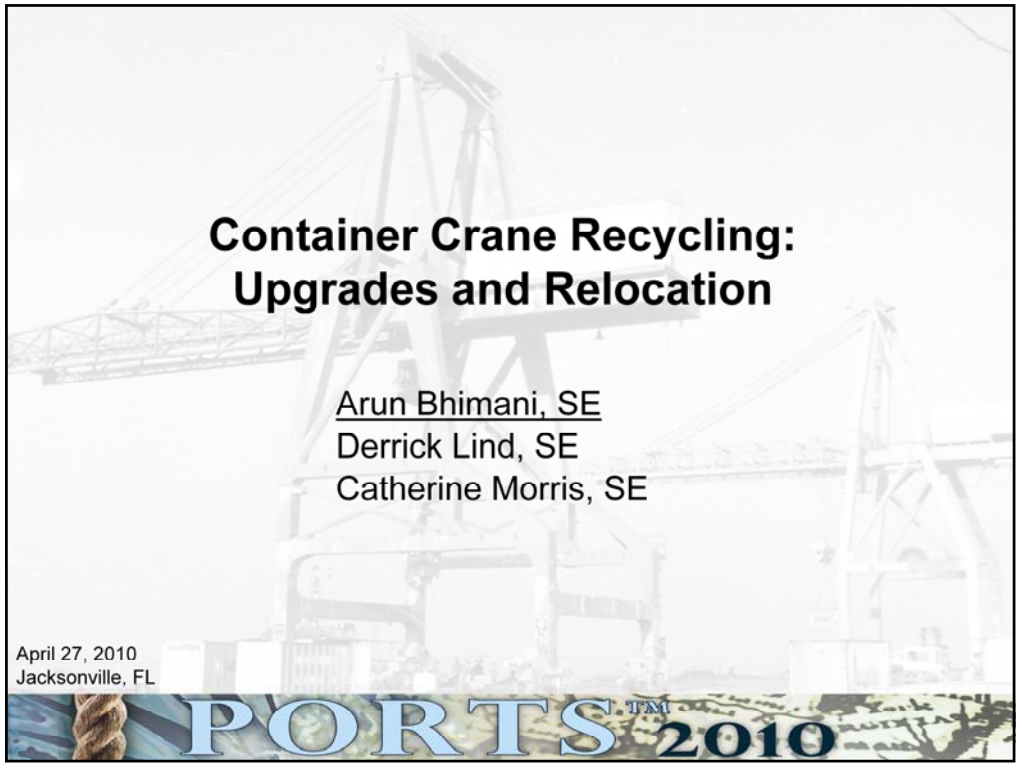
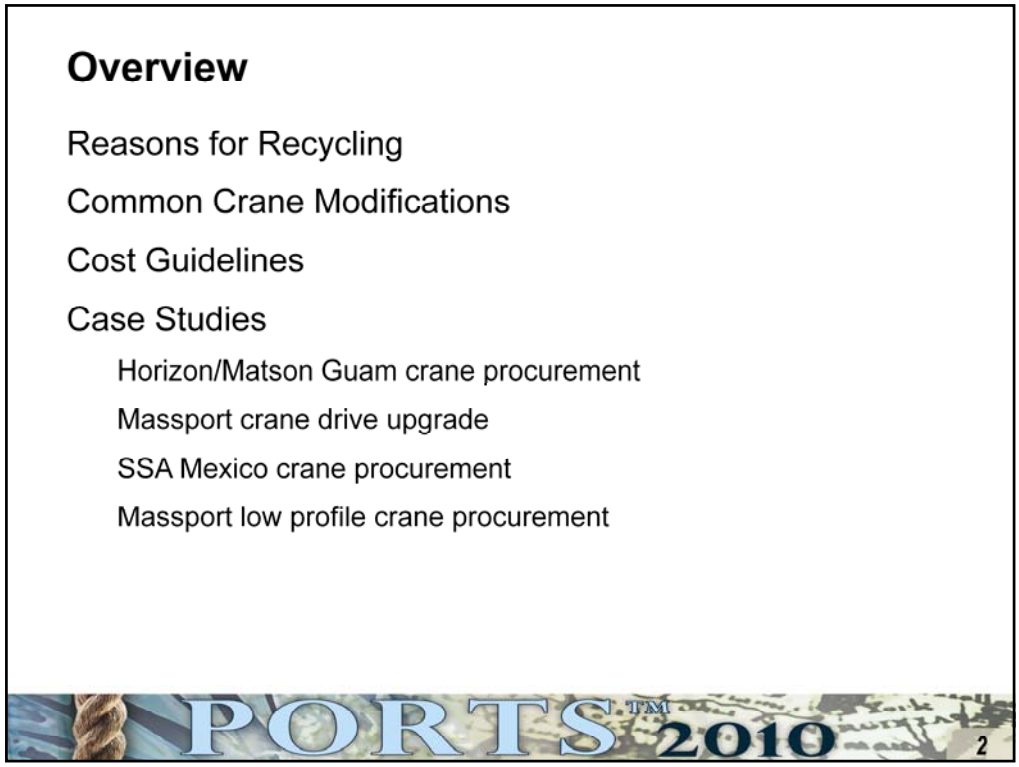


Good morning. I (Anna Dix) am substituting for Mr. Bhimani, who is responding to an emergency dealing with the container cranes damaged in a tornado in the Bahamas. The terminal may be a candidate for recycled cranes.



With the economic downturn, many port authorities and terminal operators have come under economic pressure to make do with their existing equipment, and at the same time, serve their customers in a changing environment.

I will discuss the various reasons for recycling cranes, some of the common modifications and upgrades to the existing equipment, and modification cost guidelines. I will also present our recent projects as case studies.

Reasons for Recycling

Modification
- To serve larger vessels
- To adapt to different locations

Refurbishment
- Deferred maintenance
- Correct problems

Modernization
- Increase capacity, speed
- Update controls

Other
- Replace damaged crane

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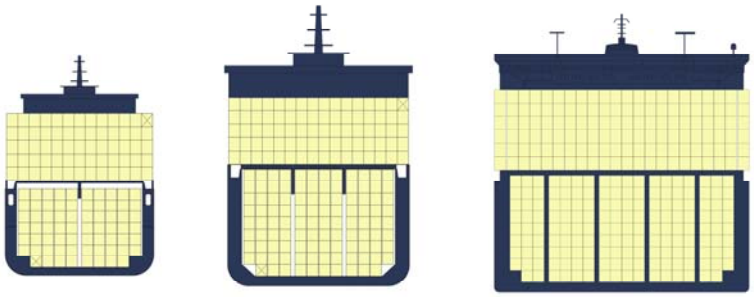
Recycling cranes generally involves modifications to serve larger vessels, or when relocating to different terminals to correct long term maintenance issues and update electrical systems. The photo shows the world's first container crane built by Paceco for Matson Shipping Lines modified for operations in China. The crane is no longer in operation.

Vessel Growth



Ship Class	Panamax	Super Post-Panamax	Emma Maersk
# Containers Wide	13	16+	22
Crane Outreach	38 m (125 ft)	≥ 44 m (145 ft)	61 m (200 ft)

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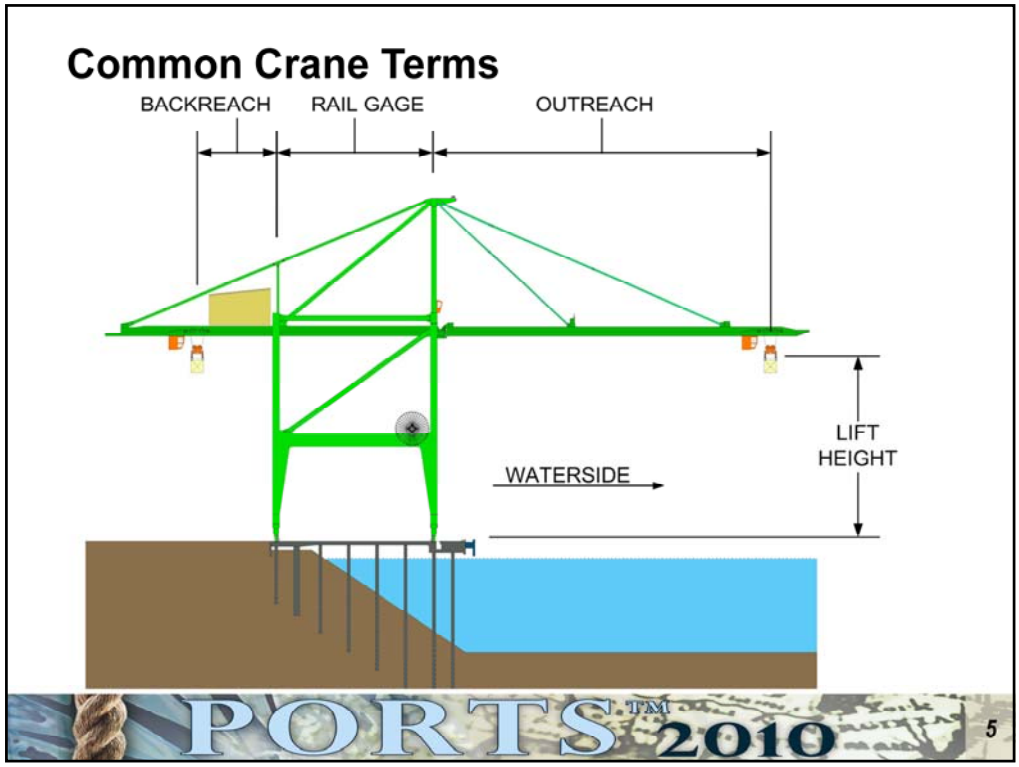
The majority of major modifications are in response to changes in the vessel size. The crane size has nearly tripled since the introduction of the first generation cranes.



Explain common terms used in the presentation - rail gage, outreach, backreach, lift height. Capacity is under the spreader (hook).

Common Crane Modifications

Geometry
- Lift height
- Outreach
- Gage

Strength
- Wind loads
- Seismic

Performance
- Upgrade drives and controls
- Increase speeds
- Increase capacity

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Modifications can be divided into geometry changes, strength upgrade, and performance upgrade. Lift height and outreach changes are required to serve larger vessels.

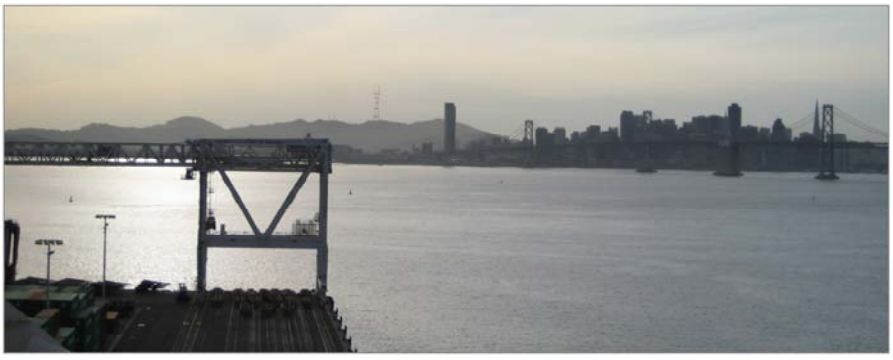
Gage change and strength change are required when the cranes are relocated. Seismic upgrades are uncommon but may require closer scrutiny.

Performance changes are dictated by obsolescence of mechanical/electrical components and to improve productivity.

Although crane structures are subject to high fatigue cycles leading to cracking, they can literally last indefinitely with proper structural inspections and repairs. Machinery requires replacements after 15 to 20 years of service due to wear as well as to improve productivity. Drives and controls become obsolete after 15 to 20 years of usage and need replacement.

Cost Guidelines

Work	Cost (USD)
Increase lift height 6 m (20 ft)	$ 900,000
Increase outreach 6 m (20 ft)	$ 1,000,000
Upgrade drives and controls	$ 1,000,000
Transportation	$ Varies (not cheap)



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The table provides cost guidelines for some of the common modifications. High transportation costs are a major deterrent to recycling. Crane owners often have to pay to dispose of the cranes.

Case Studies

1. Horizon/Matson Guam crane procurement
2. Massport crane drive upgrade
3. SSA Mexico crane procurement
4. Massport low profile crane procurement

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I will briefly provide the details of our four recent projects.

Case Study 1: Horizon/Matson Guam Crane Procurement

Horizon and Matson needed higher productivity

Impractical to upgrade existing cranes

Options

- Purchase 2 new cranes
- Purchase, modify, and relocate 2–3 cranes from another port

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Horizon/Matson Lines share a container terminal facility in Guam. The existing cranes became a bottleneck and were uneconomic to modify and upgrade. The port authority considered purchasing one or two new cranes at a cost of over $10M each.

Guam Procurement: LA Cranes

Unmodified Hitachi cranes at Los Angeles

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Horizon/Matson located three idle cranes at Port of LA. The cranes, built by Hitachi of Japan about 30 years ago, were in excellent condition but unsuitable for the port's needs. Liftech audited the structural design of the original cranes.

Guam Procurement: Modifications

Geometry
- Increase lift height by 2.4 m (8 ft)

Strength
- Reinforce for hurricane winds
- Add tie-downs and stowage bracket
- Replace boom latch

Performance
- Replace drives and controls
- Replace communication system

Other
- Replace spreaders
- Convert shore power to diesel power
- Relocate from Los Angeles to Guam

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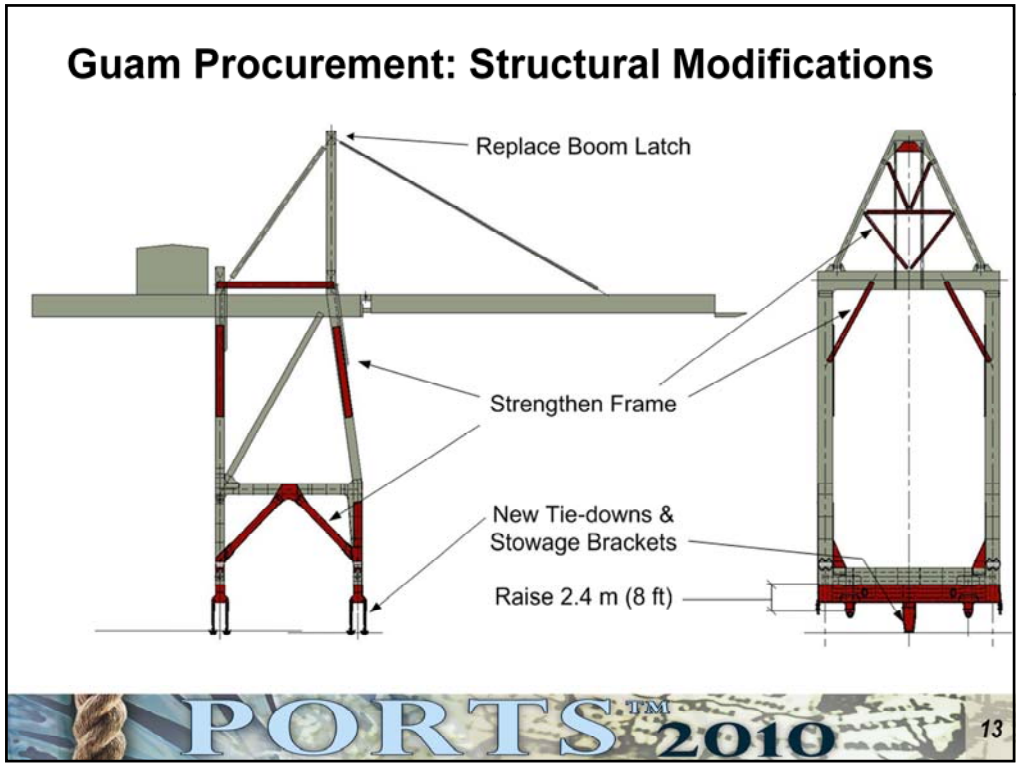
The cranes required geometry changes for the wide gage at Guam, and strength changes to comply with the hurricane conditions at Guam. Horizon/Matson also replaced electrical systems and spreaders for improved performance. The power system was changed from grid power to diesel.



The various structural changes are noted in the sketch.

Guam Procurement: Costs

Approximate costs (USD):

New crane
$10 million each

Modified and relocated crane
$6 million each

Cranes on barge

Modified cranes in Guam

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The cost comparison clearly favored a recycling approach. Transport cost was a major component.

Massport is currently upgrading the electrical systems of the four low profile cranes. The cranes were supplied by Paceco. Liftech provided the structural design of the original cranes.

Drive Upgrade: Details

Problem

- Near obsolete drives and controls

Options (costs in USD)

Purchase new cranes:	$12.5 million each
Purchase used cranes:	difficult to find
Upgrade existing cranes:	< $1 million each

Upgrade existing cranes

- Replace major drives and controls
- Install crane maintenance and monitoring system
- No geometry changes due to height restriction
- **Expect additional 15 years of life**

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Low profile cranes are required to comply with the aviation height limitations for terminals located adjacent to air fields. The electrical components were not supported by the vendors, causing maintenance delays and increasing downtime. Upgrades costing about $1M per crane should extend the life of the crane another 15 years.

Case Study 3: SSA Mexico Crane Procurement

Business opportunity

SSA Mexico in Manzanillo required two cranes fast

SSA Panama had two underutilized cranes

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It is relatively common for international terminal operators to shuffle cranes within their network to respond to changing business needs. SSA modified and relocated two cranes from Panama to Manzanillo, Mexico.

Mexico Procurement: Changes

Geometry

- Change gage from 23.1 m to 15.2 m (75.8 ft to 50 ft)
- Relocate elevator and modify walkways and platforms

Strength (for wind and seismic loading)

- Add tie-downs and modify stowage brackets
- Add ballast

Other

- Transport

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The cranes, supplied by Hyundai Samho Heavy Industries, required reducing the rail gage and strengthening the structure for higher wind and seismic demands. Liftech audited the structural design of the original cranes.

Mexico Procurement: Before and After

Original crane in Panama

Modified crane in Mexico

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Before and After

Case Study 4: Massport Low Profile Crane Procurement –*"The Perfect Match"*

Massport needs two additional cranes for second berth

Oakland needs to dispose of three cranes

Cost of new cranes: $12.5 – 15 million (USD) each

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Massport, adjacent to Boston's Logan Airport, needed 2 to 3 additional low profile cranes to respond to the anticipated volume growth. The new cranes cost upward of $12.5M each. Port of Oakland was no longer constrained to use their three low profile cranes and the tenant ordered new larger and faster A-frame cranes for the current generation vessels.

Massport Procurement: Crane Comparison

Parameter	Massport	Oakland
Rail Gage	29.3 m (96 ft)	29.3 m (96 ft)
Maximum Height	41.1 m (135 ft)	40.2 m (132 ft)
Outreach	45.7 m (150 ft)	45.7 m (150 ft)
Lift Height	30.8 m (101 ft)	29.4 m (96.5 ft)
Rated Load	50 LT	50 LT
Power System	Power Cable	Power Cable

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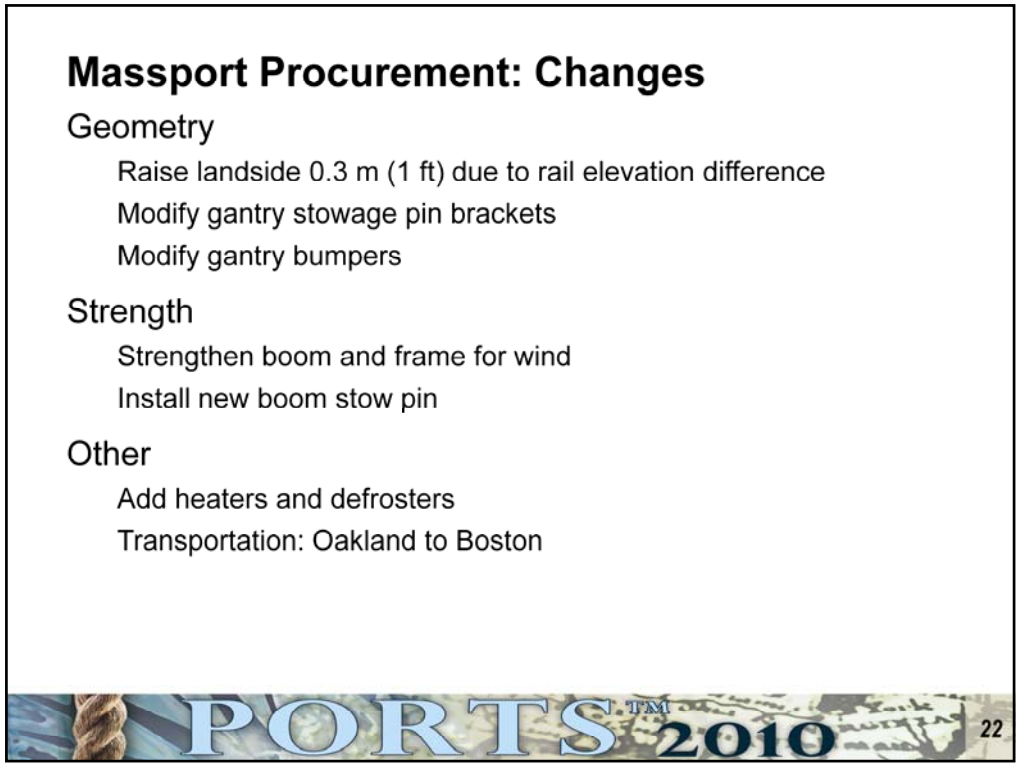
The Oakland cranes were a perfect match for Massport.



Minor modifications were required. Transportation and modification cost was $8.5M for four RTGs and two ship-to-shore cranes.

Summary

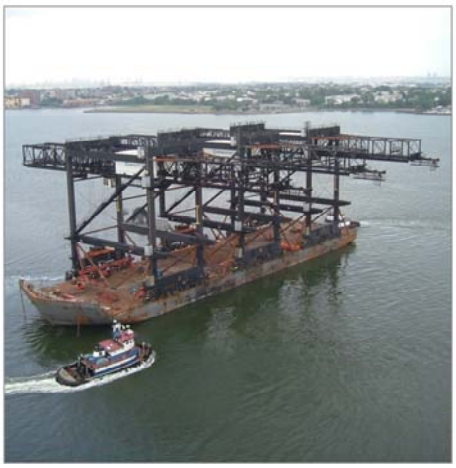
Recycling cranes is a viable option

Majority of modifications are

- Lift height increase
- Outreach increase
- Gage change
- Drive modernization

Relocation costs are significant

Investigate options



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Crane recycling is a viable option and should be carefully evaluated, particularly if the cranes do not need to be relocated. Transport costs are often the deal breakers if the cranes need relocation.

Thank you. Please visit the Liftech website and blog for more information.

Acosta Bridge, Jacksonville (cityscape in background)

Liftech Consultants Inc. file data:

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